THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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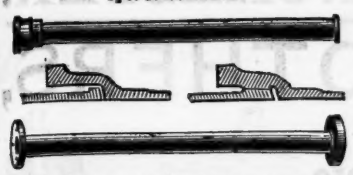

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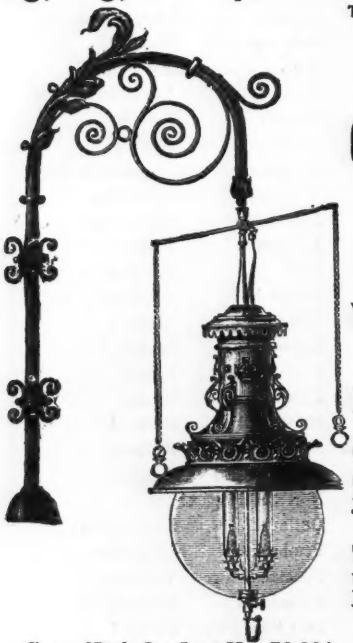

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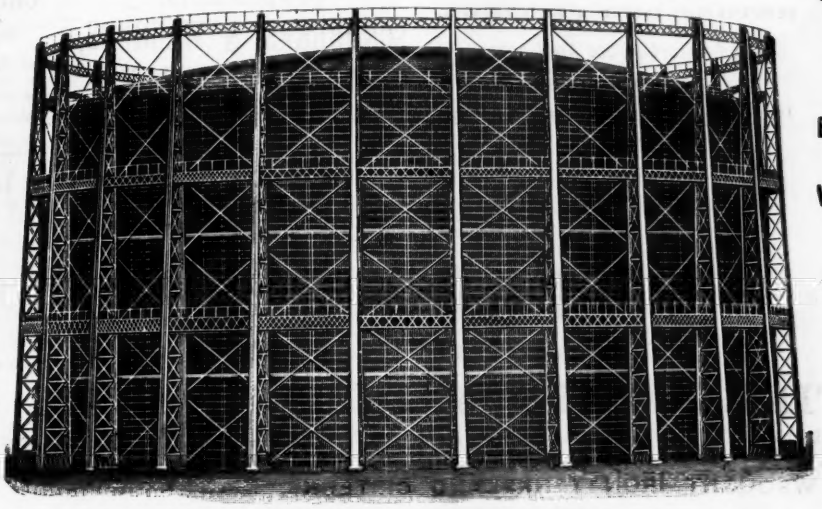

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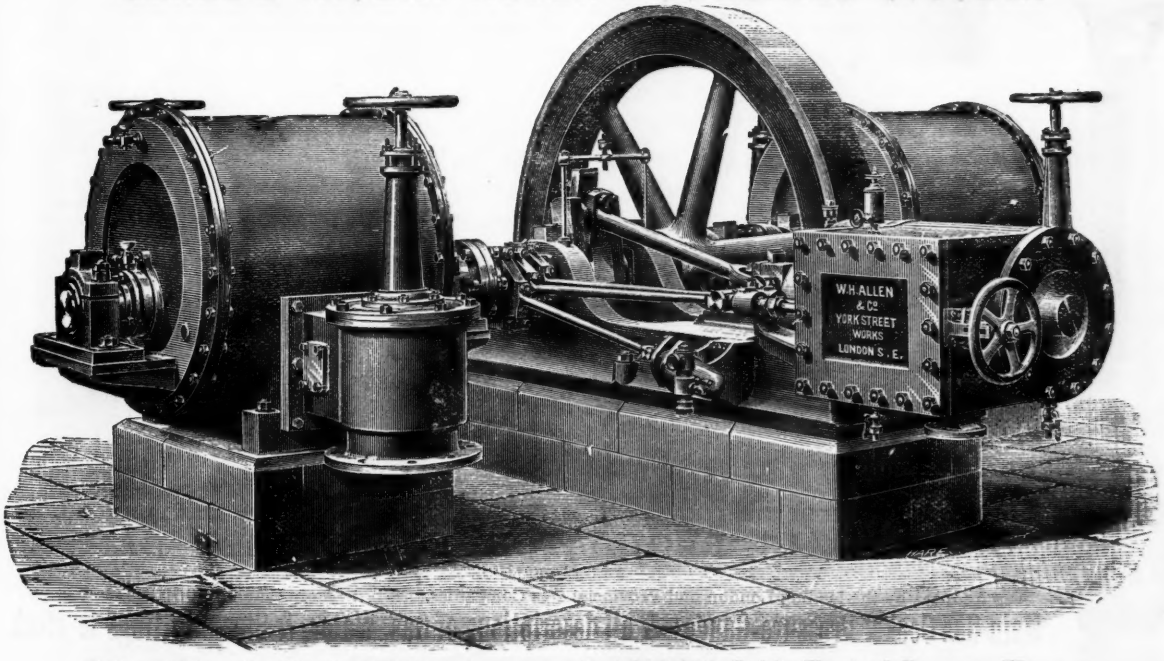

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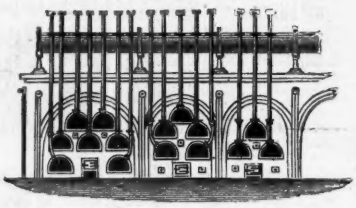

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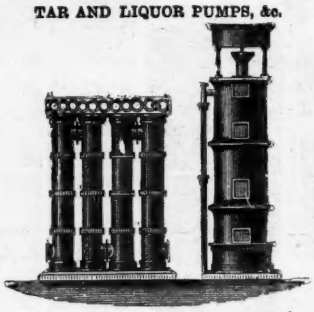

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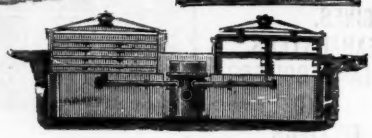

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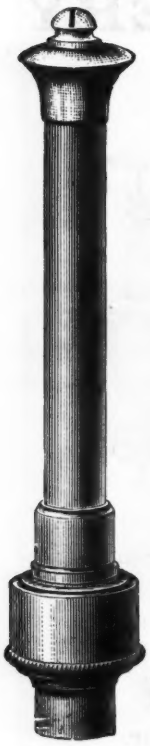

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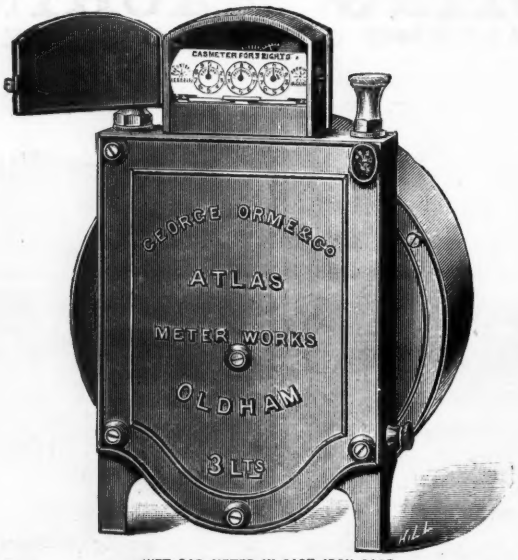

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1892	Bathurst (N.S.W.)	2	All	82	36
1895	Athens (Greece)	2	All	64½	42
1890	Tyne Dock Gas-Wks., N.E.Ry.	2	All	71	42
1890	Newburn-on-Tyne	2 & Tank	All	47½	52½
1894	St. Austell Gas Company	2	All	34	34
1894	Birkenhead Corpn.	4	2 Top	160	120
1894	Cape Town (S. Africa)	3	Do.	50	48
1892	Nottingham Corpn.	4	1 Top	100	100
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1893	Do.	4	Do.	90½	100
1890	Manchester Cor. (Gaythorn Wks.)	3	Do.	130	90
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1890	Do. Do.	3	Do.	100	75
1889	Do. (Rochdale Road)	3	Do.	100	75
1891	Darlington Corpn.	3	Do.	100	73½
1895	Barrow-in-Furness	2	Do.	100	41
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Perth (W. Australia)	2 & Cup	Do.	75	40
Derby Gaslight Co.	4	Top	125	102
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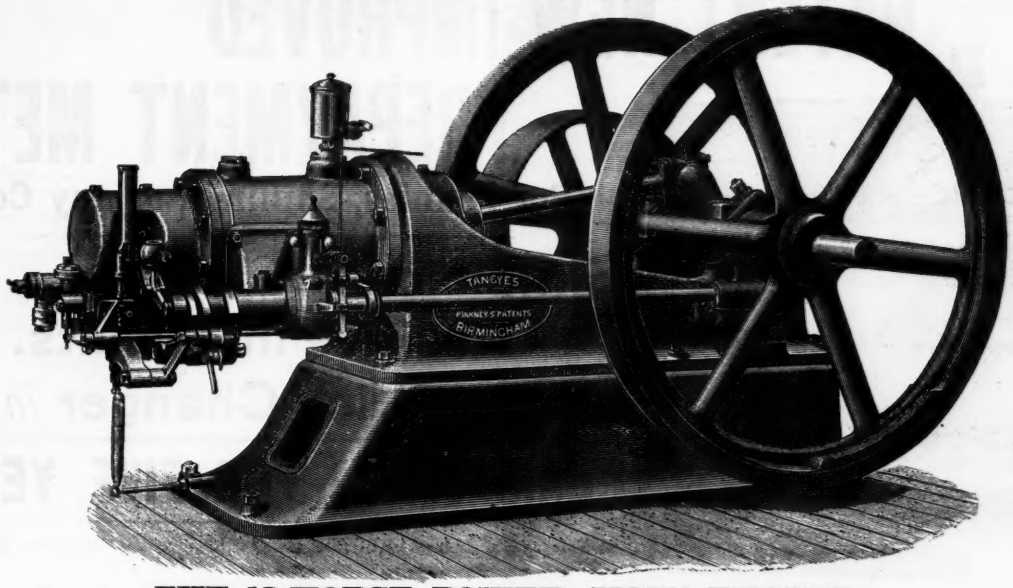

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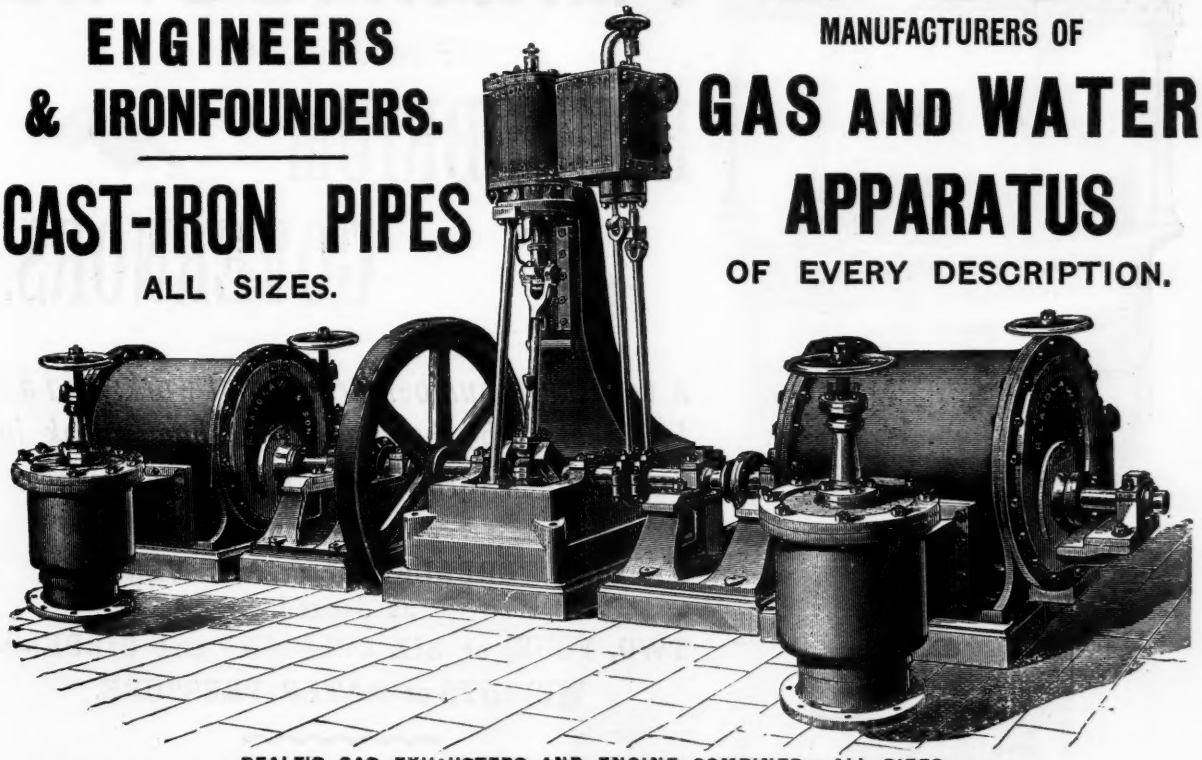

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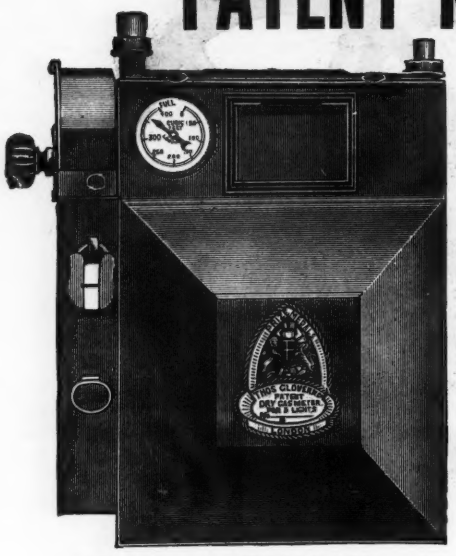

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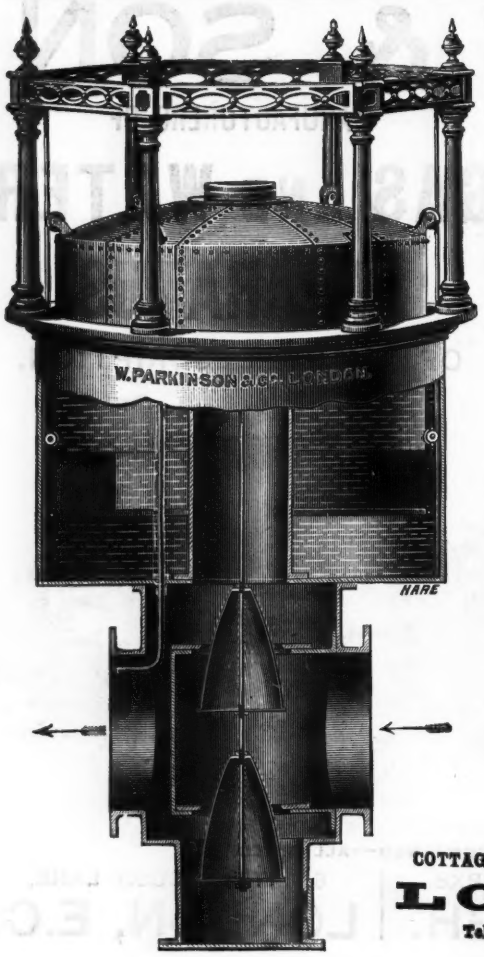

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EDITORIAL NOTES.

Report on the Liverpool Gas Supply.

THE substance of an important report of the Special Sub-Committee of the Liverpool City Council on the gas supply of the city will be found in another column. The report was only issued to the members of the Corporation a few days before their last meeting; and so no discussion upon it will arise in the Council until a sufficient time for consideration has been allowed to elapse. It appears meanwhile that the Lighting Committee have adopted the facts and figures collected by the Sub-Committee; but whereas the latter body have decided against the idea of a transfer of the gas undertaking to the Corporation, the larger body do not endorse this conclusion—preferring to leave the question open. The publication of the report constitutes an era in the history of the gas supply of Liverpool, inasmuch as the Sub-Committee took a very serious view of their duty, and undertook to make a "full and searching "inquiry into the relations between the Corporation and "the Gas Company—the character of and conditions "under which gas is supplied to the consumers in Liver-"pool—the equipment and general management of the "gas-works and cost of production, together with the "past, present, and prospective financial aspect of the "question." This was obviously a "large order." The Sub-Committee had the assistance in their investigations of Mr. Charles Hunt, of Birmingham, and also of Mr. C. R. Bellamy, the Gas Inspector to the Liverpool Corporation. They also acknowledge the frankness with which their inquiries were met by the Directors of the Gas Company and by Mr. W. King, the Engineer. The upshot of the investigation, as already indicated, was a conclusion on the part of the Sub-Committee adverse to the purchase of the undertaking. Feeling, however, a necessity for some closer oversight of the undertaking in the interests of the consumers, they advocate the appointment on the Board of the Company of two or more members of the Corporation—the Sheffield plan, in short. It is also considered that the powers of the Public Auditor should be increased; and that fresh gas capital should be more largely in the form of debentures, in which the Corporation might invest. Lastly, having regard to the changes now in progress, both in the cost and method of producing gas, the Sub-Committee "are of opinion that no disadvantage is "likely to accrue to the consumers by not pressing for "alterations of the candle power for the present, but that "improvements in the manufacture which would cheapen "the cost of production are possible;" and the Directors are to be urged to take the necessary action.

For evidence in support of these conclusions, it is necessary to turn to the experts' reports; and our abstract, which is taken from that published by a Liverpool paper, confronts the inquirer at the outset with the disconcerting statement that whereas the enrichment of the gas supply to the high standard imposed by law upon the Company costs, according to Mr. Hunt's estimate, from 2d. to 2½d. per candle per 1000 cubic feet, Mr. King appraises the same unit of enrichment at 1d. only. Hence, it is not surprising that while the Sub-Committee formed a vague idea that all enrichment above 16 candles might turn out to be wasted, they declined to commit themselves to a definite decision on the matter. Neither is it to be wondered at that the Sub-Committee should have got themselves into a hopeless state of bewilderment through trying to harmonize the cost of coal and the candle of illuminating power in Liverpool, Sheffield, and Manchester—a favourite exercise of the now extinguished luminaries of the old City Council. In their discomfiture, they took the wisest course open to them. They simply asked Mr. Hunt to advise them as to whether the Liverpool gas-works are properly equipped for manufacturing gas on the most economical principles; and also whether the carbonizing materials used are the cheapest for the candle power required. This was both a delicate and a difficult charge to lay upon a working Gas Engineer who might at any time be subjected to the same examination at home. Mr. Hunt appears to have acquitted himself of the somewhat invidious task with a good deal of grace, while not shrinking from his duty of criticism. He finds little to complain of in the Liverpool works; but he discovered a comparative lack of labour-saving appliances, and a multiplicity of small establishments.

The Sub-Committee cross the "t's" and dot the "i's" of this report by observing that they have the idea that the interests of the Liverpool gas makers and of the consumers are not, under existing conditions, so thoroughly identical as to keep the Directors' policy quite up to the highest economical mark. Mr. Hunt, on the other hand, is able to dispose of a stupid municipal calumny on the Gas Company, and assure the Corporation that the selection of carbonizing material is well and carefully made by the Board and their advisers, having regard to the onerous conditions under which the supply has to be carried on. Altogether, the Sub-Committee have done their work well; and if they should not have the satisfaction of bringing about a complete settlement of the Liverpool Gas Question, they have at least succeeded in placing it upon a sound basis of facts.

An Expert Opinion of the Coal Mining Industry.

The industry of coal mining has an affinity technical, as well as commercial, with that of gas manufacture, inasmuch as it is likewise one of the important class of industries, in which some of the greatest national interests are comprised, which have grown from very small and crude beginnings to a condition of enormous development without having been aided by any extraordinary modern discovery or invention. It is sometimes said, with the intention of disparaging the "scientific" character of gas manufacture, that the making of gas remains to-day, except in respect of comparatively small details, very much as Murdoch left it. The reproach, such as it is, does not hurt gas makers very deeply, because it is more inspired by envy than by any other spirit. According to Mr. G. A. Mitchell, who presided last week over the general meeting of the Federated Institution of Mining Engineers, the present state of coal mining in this country is also the result of a large number of small advances and improvements upon ancient conditions, of vast aggregate importance for good, rather than of any single reformation of its methods. The coal hewer still works at the face of the seam as of yore, and the coal is put upon the market for the consumer to buy. But the moment inquiry is made into the circumstances by which the ultimate result is affected, a striking accumulated progress is revealed. The community hears occasionally of mine explosions with many victims; but the death-rate due to this cause has actually been brought down to 0·281 per 1000 persons engaged during the past five years, and coal mining stands well to-day in the order of the healthiest occupations. So long as gas explosions in coal mines continue to occur, however, those who are responsible for the conduct of the industry will have work to do in preventing their recurrence; and it is gratifying to learn from Mr. Mitchell that it is possible to look forward hopefully to a time when such disasters will be unknown. Speaking of the preparation of coal for sale, Mr. Mitchell observed that the introduction of improved screening and picking arrangements, and of washing machinery, is of recent date—so recent, possibly, that gas coal has not yet come very much under the influence of such improved methods of cleaning the product. At any rate, it now becomes an interesting question for gas makers to ask themselves, as to whether some of the work of purification now done upon the gas might not be anticipated by better treatment of the coal. There is something in this; for many years ago the late Mr. Mann, when Engineer of the old City of London Gas Company, succeeded in sending out a remarkably clean gas by having recourse to the expedient of picking over every lump of coal by hand before it was allowed to be put into the retorts. With reference to the ever-present labour question, Mr. Mitchell only ventured to remark that it was unfortunate that the present time should be chosen for an agitation for a minimum wage, when the outlook for the coal trade was so unpromising. He did not mention the countervailing consideration that if the men grow unreasonable in their demands, the employers have a guide of their own, in the shape of a minimum profit, which will indicate where the line of resistance must be drawn. One of the most reassuring of Mr. Mitchell's observations had reference to the duration of the British coal-fields. He did not think there was anything to trouble about on this score; and he was of opinion that the experience of the past should teach people to be very careful about prophesying the exhaustion of the supply, which has caused occasional scares for the past three hundred years.

Mr. Ransome on Wages in the Engineering Trade.

In the current number of the "Engineer," Mr. J. Stafford Ransome continues his extremely instructive criticism of the conditions determining rates of wages in the engineering trade. This particular essay is not, perhaps, so generally interesting as the earlier articles in which the same inquirer disproves the prevalent superstition that Trade Unions are instrumental in improving the economic condition of the workman; but it manifests great power in dealing with the recondite question of why men engaged in the same trades are paid such varying rates of wages in different places. Mr. Ransome brings into prominence the fact that, with or without Trade Union prescription, different men catalogued as members of the same trade receive very different pay even in the same place. There are, indeed, towns in his list where operatives classified under the same sectional description are paid both more and less than men employed in the same way elsewhere. In the more important and better-defined branches, the difference is not so great as in some of the trades which may be held to include workmen of very varying ability and technical importance. Anyhow, the facts abundantly testify to the failure of Trade Unionism to level-up or level-down wages, and place the latest Socialist notion of the "living wage" in greater discredit than ever. After passing in review several of the more patent influences affecting the value of labour, Mr. Ransome observes, by way of summing up the evidence, that "it would appear that wages are "low in such districts as, by their position and surround-"ings, may be termed the natural homes of the industry, "and high where that industry is carried on under "artificial or forced circumstances. . . . Nature and "the railway companies have a great deal more to do, "primarily speaking, with fixing the localities and wages "in the engineering industry than have either master, "man, trade union, or politician. For Nature points out "the localities where the work can be carried on cheapest; "and the railway companies determine how far other "districts may be artificially brought in to serve the same "purpose, and the rates of local wages are, as a matter "of course, dependent on these considerations." What applies to the engineering trade holds good of many others. In the work of gas making, the course of the same economic law is more apparent in the cost of yard labour than in stokers' wages; theirs being an artificial occupation unconnected with any similar employment in town or country.

Compensation for Compulsory Purchase.

That old friend of the land surveyor and the valuer, the 10 per cent. addition for compulsory purchase, was the subject of animated debate in the House of Commons on Thursday, in connection with the Light Railways Bill. In Committee it had been decided (on the casting vote of the Chairman) that, in determining the amount of compensation for land taken compulsorily, nothing should be added by the valuers to the amount in respect of such compulsion. As this provision involved considerable departure from practice, the Government decided to take the sense of the House on the point. It is obvious that, although the innovation in question was confined to the particular measure, if the principle were once formally adopted by Parliament on the ground of public advantage, its application could not be prevented from spreading to other proceedings in valuation. The Government admitted that there is no statutory obligation imposed upon arbitrators to add 10 per cent. for compulsory purchase; but it is conceded to be a recognized custom. Mr. Ritchie confessed ignorance of the historic reasons for the custom; but he said he understood that now "con-"sideration was given to the fact that when a man was "compelled to part with property against his will, some "allowance was held to be due to him for compulsory "severance, and also for the difficulty and inconvenience "attending re-investment." For his part, he avowed his sympathy with these considerations, which are much more forcible now than when the compulsory acquisition of land for public purposes was first introduced. On the other side, Mr. Bryce argued that the custom had grown up without parliamentary sanction, having been formed among surveyors themselves, and had now become so consolidated as to require a declaration of the House to prevent surveyors from following it. The Attorney-General, in reply, pointed out that no provision of the kind would

have the smallest effect upon the valuation of the property. In the event, the proposal of the Government to leave the system of valuation as it stands was carried; so that the arbitrators on a valuation will still have to take account of the customary premium for compulsory sale, although, of course, there is no obligation upon him to allow it where he does not think it deserved. In actual practice, this surcharge very often serves to draw attention to an otherwise exorbitant valuation; but where the amount claimed for compensation is clearly the fair value of the property, it appears reasonable that the forcibly expropriated owner should receive something to recoup him for his trouble and the inconvenience, now more formidable than ever, of re-investment.

The Use of Oxygen as a Remedy for "Gassing."

Not so much is heard nowadays as formerly of the use of oxygen in gas-works; but events which will be fresh within the memory of readers of the "Journal" lend acute interest to the suggestion, recently developed in the pages of a scientific contemporary, that a cylinder of the compressed oxygen of commerce should be kept at hand in the ambulance stores of all factories where workmen are liable to be "gassed." It has been stated that oxygen is the best, safest, and quickest restorative for sufferers from this dangerous and distressing accidental injury. According to the same statement, the application of this remedial agent is of the simplest; all that is needed being to introduce into the sufferer's mouth the end of a piece of tubing attached to the cylinder, and allow a gentle flow of the gas to enter his lungs by the ordinary process of respiration. If respiration is suspended, it is, of course, necessary to promote its resumption by the well-known method of manipulating the chest and nostrils, as in the case of persons apparently drowned. It is further observed that the oxygen treatment of "gassing" prevents the subsequent distressing headache and other troubles usually incident to this mishap. We desire to bring this subject before the attention of our readers, in order that any helpful experience in connection with the matter may be placed upon record for the benefit of all followers of the industry. It seems hardly necessary to mention a matter of this kind in these columns, inasmuch as the importance of "first aid" remedies may be supposed to be universally appreciated by the responsible managers of modern gas-works. Yet there is only too much reason to suspect that in too many factories of all kinds there is no provision for meeting the most ordinary emergencies of accidental injury in any other way than by "sending for "the doctor." Happily, most large gas-works have now their Red Cross companies; but there is none too small to contain a box in an accessible spot, with a store of cotton wool and carbolic oil for burns, and the one or two other common surgical comforts which the roughest workman knows how to use at a pinch. If any reader has a word to say for or against the oxygen bottle as a part of surgical equipment a degree or so higher in the scale than the above, we shall be glad to hear from him.

Personal.—Mr. J. W. Buckley, Assoc.M.Inst.C.E., of Falmouth, has been desired to make an exhaustive report on the Hayle Gas-Works.

The Forthcoming Meeting of the German Association of Gas and Water Engineers.—The complete programme of this meeting, which will be held at Berlin from the 16th to the 18th inst., as already announced in the "Journal," is now to hand. The annual report and the election of officers for the ensuing year will first occupy the meeting; and then the reports of the various Committees appointed by the Association will be taken. Of these, that of the Photometric Committee presented by Herr Thomas, of Zittau, that of the Gas-Meter Committee, presented by Herr Wunder, of Leipsic, and that of the Committee on Inclined Retort Settings, presented by Herr Reissner, of Berlin, should prove very interesting hearing. Among the papers by individual members we notice one by Professor Wedding, of Berlin, on "The Propagation of Waves of Light;" a review of the developments of the last decade in gas-works, by Dr. E. Schilling, of Munich; comments on the Welsbach incandescent light, by Herr Söhren, of Bonn; a paper on gas motors as a means of producing electrical energy, by Herr Joh. Körting, of Hanover; notes on the inclined retorts at the new works at Cassel, by the Engineer (Herr Merz); experiences in stoking machinery at Charlottenburg, by Herr Schimming; and a paper by Dr. H. Bunte, of Carlsruhe, on "Bye-Products." The hall of the Chemical Section of the Berlin Industrial Exhibition has been set apart for the meetings, which commence at nine o'clock on each day. The second day is devoted to water supply.

WATER AND SANITARY AFFAIRS.

Mr. G. J. Symons—as good an authority as one could wish for on the subject—reports that between Jan. 1 and June 1, the rainfall in London was little more than half the proper average, and was deficient to the extent of 3¾ inches. On Wednesday evening, there came a smart fall of rain in the Metropolis, giving in half an hour more water than fell in the whole of April and May. Under the previous condition of things, some anxiety with respect to the water supply would be almost instinctive; and this may account for the circumstance that the "Standard" made some inquiry into the matter. Among others, Mr. Crookenden, the Secretary of the East London Water Company, was interviewed, and is reported as stating that the position of affairs would become very serious if no rain fell and the existing rate of consumption was maintained. After so long a drought, it was reasonable to expect that rain would fall; and so it came to pass on the day this statement was published. Another point to be dwelt upon, is that the reservoirs authorized by the Company's Act of 1894 are not all complete. Had these been in operation, Mr. Crookenden might have spoken with more assurance as to the future. Colonel Ducat and Dr. Barry, of the Local Government Board, who inquired into the causes of the restricted water supply in East London in the summer of 1895, stated in their report "that steps have already been "taken by the East London Water Company which should, "in our opinion, afford sufficient storage of water to meet "any deficiency in the supply of water within their dis-"trict for many years to come." There is, or was, the less reason to be alarmed at the recent drought; seeing that a worse ordeal was passed through three years ago, if we are to trust the statement of Mr. Symons, that in respect to its drought, 1896 "does not approach the "severity of 1893." No doubt the East London district suffers a peculiar strain; and the misfortune is that Parliament threw back the remedial measures by a whole year. Mr. John Goodwin, the Secretary of the Grand Junction Company, was also interviewed, and stated that his Company had not had occasion to limit the supply in any way—a circumstance which he attributed to the presence of innumerable springs in the Thames, "which "tended to keep the supply about normal." At the offices of the West Middlesex Company, the Secretary (Mr. Wybroo) disclaimed any uneasiness on the part of the Directors. The Engineer, in like manner, "did not anti-"cipate having to curtail the supply." The question is really one of reservoirs more than anything else; and, as we intimated last week, London has an ample supply of water close at hand, to be turned to account by means of adequate works.

A somewhat amusing episode in the history of the London Water Supply is furnished by the artesian well of the City Commission of Sewers. This is a wonderful well; and we shall never hear the last of it. Mr. Malthouse has made the discovery that, whereas this well has been an expensive affair, the money has been well spent, "if only "in establishing that the alleged monopoly of the New "River Company to supply London with water had no "existence." This so-called artesian well—whereas it is not artesian—proves nothing except what had been proved before—that water is to be had by digging or boring for it, and whoever finds it may use it for his own benefit or give it away. There were scores of wells in London before the City Commissioners of Sewers caused one to be made in order to supply their artisans' dwellings in the Minories. The City well so far has been an unprofitable undertaking; but now it is suggested that the water not required for the artisans' dwellings should be utilized for street cleansing and sewer flushing, whereby the £1652 per annum hitherto paid to the New River Company would be saved. Perhaps the Commissioners of Sewers will also arrange that the surplus water shall be used for the extinction of fires; only in that case nothing will be saved, as the New River Company make no charge for such service. We observe that the London Sea Water Bill, which might be expected to trench on the domain of the Water Companies, has lost its popularity with the Commissioners of Sewers, certain clauses having been introduced which if passed will give the County Council jurisdiction over the streets of the City for the purposes of the Act. The clauses are to be opposed, the Commissioners having no more love for the County Council than

for the Water Companies, if so much. Mr. Malthouse complains that, inasmuch as the charge for water is regulated by the rateable value of the premises supplied, so it comes to pass in some districts that "the water actually used" is as dear as champagne. We should doubt this; but, if economy has to be considered, what have the Commissioners to say to the fact that the water now taken from their artesian well costs about three times as much as if the supply were taken from the New River Company?

On Thursday last, the Hybrid Committee of the House of Commons, presided over by Sir Joseph Pease, resumed their consideration of the Staines Reservoirs Bill. The weather has occasionally fought against the Water Companies, whether by frost or by drought; but the recent absence of rain may be supposed to have quickened the apprehensions of the Select Committee as to the value of the Staines scheme, by which, in conjunction with lesser projects, London would long be protected against the miseries of a deficient water supply. It is perfectly certain that the water system of the Metropolis cannot be allowed to stand still. It must be developed *pari passu* with the population; and no remote and uncertain project, like that of the Welsh supply, must be allowed to block the way. Among the devices of the London County Council to embarrass the plan of the Staines reservoirs, we observe the favourite hobby of Mr. Binnie, that there ought to be a provision of compensation water. What is the compensation required for? Mr. R. Middleton, who was an Assistant-Commisioner in the inquiry over which Lord Balfour of Burleigh presided, very properly remarked while under cross-examination by Mr. Claude Baggallay, that it was not necessary to provide compensation water, seeing that the Thames, in that part affected by the scheme, was not a river along which there were mills and manufactories worked by water power. The true provision for maintaining the volume of the Thames consists in providing that the flow over Teddington Weir shall never be less than 200 million gallons per day. This is a guarantee against the effect of a dry season; and it is perfectly correct to say that the plan to be carried out under the Bill would really improve the flow of the river. On the other hand, the absolute need of providing for an enlarged supply was made clear by trustworthy statistics. If the water is wanted and can be had, the case is proved; and it is useless to cavil about subordinate questions. No greater urgency can be imagined than that which relates to the water supply of a populous city. The Metropolitan Water Companies are coming forward to meet the necessity which is now pressing upon them; and it is shown that the benefit will be to the consumer instead of the shareholder. The Deputy-Governor of the New River Company declares that the Staines project will be a source of loss to that Company, instead of profit. The statutory obligations must be fulfilled; and it is startling to hear how little margin of supply is left to some of the Companies.

One singular feature in respect to the Staines Reservoirs Bill is that the County Council are opposed to the attempt of the Thames Conservancy Board to increase the contributions levied on the Companies in respect to water taken from the river. The same question arises with reference to the Southwark and Vauxhall Bill. For once the Council are in agreement with the Companies, though it is only on one point. The reasons for this procedure are given in a report of the Rivers Committee, coming before the Council to-day. Concerning the broader question of the entire Metropolitan supply, the Water Committee recommend that "a Bill or Bills" be prepared for introduction in the session of 1897, for the purchase of the undertakings of the eight Metropolitan Water Companies. It is also recommended that a Bill be prepared seeking power to commence the works which are to bring a supply from Wales.

Security for the Cash-Boxes of Prepayment Meters.—Messrs. Thomas Glover and Co. have patented an exceedingly simple and efficient contrivance for the greater security of prepayment meter cash-boxes. It consists in a modification of the padlock by which the keyhole is sealed against duplicate keys. The front of the lock-case is lengthened, and the keyhole flap is brought down to a similar length; a hole is drilled in both, and the collector inserts a lead eyelet, which is sealed with special pliers having the gas company's private mark. The cost of the padlock is small; and it is claimed that the security obtained by its use is greater than that given by the most costly appliances of a similar nature.

THE INCORPORATED GAS INSTITUTE.

PROCEEDINGS AT THE THIRTY-THIRD ANNUAL GENERAL MEETING,

HELD AT THE

SOCIETY OF ARTS, LONDON, JUNE 9, 10, 11, 1896.

W. R. CHESTER, Esq., M.Inst.C.E., President.

INAUGURAL ADDRESS.

GENTLEMEN,—My first duty in addressing you from this chair is to convey my hearty thanks for the honour you have done me in electing me to the proud position of your President. It is an honour which I deeply appreciate, though accompanied by some misgiving as to how far it will be possible for me to maintain the high standard set by a long list of able men who have occupied this chair with much distinction and ability in the past.

During the thirty-three years which have elapsed since the formation of this Institute and its predecessor, the British Association of Gas Managers, there have been twenty-six different Presidents, all men in the very front rank in their profession, and to whom the gas industry at large is not a little indebted for its present prosperity. Of these twenty-six gentlemen, I regret to say that no less than one-half have already passed over to the great majority; and during the present year we have to mourn the loss of one in Mr. Denny Lane, who twice occupied the presidential chair, and who by no means held the lowest position in our respect and esteem. His genial presence, his literary polish and natural humour, his vast experience and versatile attainments, will long remain green in the memory of all those who had the good fortune to know him and to hear him speak.

As will be seen from the report of the Council, the condition of the Institute is flourishing; and we have entered on a new era of prosperity, after having triumphantly surmounted all the difficulties of disintegration with which the Institute was threatened eight years ago. The number of members continues to grow; and the balance-sheet at the end of the year shows the substantial addition of £86 11s. 1d. to the credit of the funds, after having provided for current expenditure to date, and got rid of all past accumulated arrears.

The gas industry during the past year has continued to show a steady growth; and it is my pleasure to congratulate you on its prosperity. The latest returns to the Board of Trade show that £69,423,431 have been invested in the authorized gas undertakings of the country, which is an increase of 1¾ millions on the previous year. The coal carbonized has been 11,319,301 tons—an increase of 300,000 tons on the previous year. The gas sold has been 105,160,990,000 cubic feet—an increase of 3274 million cubic feet on the previous year; while the total receipts amount to £19,408,265, and the cost of production to £13,791,520, thus leaving a margin of £5,616,745 gross profit, sufficient to pay 8·1 per cent. on the total capital employed.

As regards our colleague and competitor in some respects, the electric light, we have, I am happy to say, now emerged from the academic era of mystery and audacious prophecy, to which we grew so accustomed in the early stages of its career, into one of practical intelligibility, whereby it is possible to accurately determine its position, and to measure its capacity as a competitor for the supply of artificial light, heat, and motive power. So far as its use for heat and motive power is concerned, the progress made is so little that it may be left out of the calculation; and though daily growing in public favour as an illuminant, it is being daily left farther and farther behind in the race for popular patronage, and for many years to come is still likely to enjoy the equivocal complimentary title of the "Light of the Future," which no gas engineer will begrudge it. From an examination of the figures given in "Lightning" for the 7th ult., it appears that the total capital invested in the authorized undertakings of the country is £6,470,942; the output of electricity being 24,145,719 Board of Trade units of 1000 watts each, the total receipts from which amount to £692,734, and the expenditure to £377,691—leaving a balance of £315,043 as gross profit, which is equal to 4·87 per cent. on the capital employed.

From these figures, it is very easy to note the relative position it occupies as an illuminant, compared with coal

gas. Taking the recognized consumption of electrical energy for 8, 16, and 32 candle power incandescent lamps at 4 watts per candle per hour, a Board of Trade unit yields a light of 250 candles for one hour (1000 ÷ 4 = 250), or 250 candle-hours. One thousand cubic feet of 16-candle power coal gas, consumed at the rate of 5 feet per hour, yields a light of 3200 candles for one hour (1000 × 16 ÷ 5 = 3200) or 3200 candle-hours. The equivalent of 1000 cubic feet of 16-candle power coal gas in lighting power is therefore 12·8 units of electricity (3200 ÷ 250 = 12·8). Now, if we divide the total output of electricity for the year, 24,145,719 units, by 12·8, we get as the equivalent in 16-candle gas a total consumption of 1,886,384,000 cubic feet. The actual increase in the consumption of gas for the year under consideration was 3274 millions; so that the total output of electricity for the whole country is little more than one-half the normal progressive increase in the consumption of gas for one year; or, to put it in another way, nearly two additional installations of electric light plant of equal magnitude to the existing one would have to be put down each year before the normal annual growth in the consumption of gas would be arrested, and any serious competition be felt.

Turning from the general to the particular, it will be interesting to trace the effect in Nottingham, and see how the comparison holds good with that of the two industries spread over the whole kingdom. The Nottingham Electricity Works belong to the Corporation. They were designed and are managed by Mr. Herbert Talbot, M.I.E.E.; and being one of the most modern and the best equipped works in the country, as is shown from the low cost of production compared with works of much larger output, and from the fact that since they opened nearly two years ago there has not been a single failure to record, nor a single time when the full voltage has not been kept on the mains, they may be taken as a fair example of the best that may be expected from electric lighting.

The plant was originally designed to supply 10,000 8-candle power lamps, but has since grown to 12,000 8-candle power lamp capacity; and the capital cost up to the 31st of March last was £53,700, or £4 9s. 6d. per 8-candle power lamp. The electrical energy sent out was 183,271 units, or an average of 15·27 units per lamp.

A careful examination has been made of the accounts of 86 consumers who have had the electric light laid on, and who have used it unintermittently for a clear year. The total quantity consumed by these 86 consumers, who may be taken as representing a fair average of all classes, and who have been selected for no other reason than that they have had an entirely unbroken year of consumption, is 95,470 units, or about one-half of the total output for the year. In the year prior to the introduction of the electric light, these 86 consumers took 25,725,100 cubic feet of gas, for which they paid £3215 12s. 9d. In the year following, the same consumers took 18,691,500 cubic feet of gas costing £2336 8s. 9d., and 95,470 units of electricity costing £2386 15s.; total, £4723 3s. 9d.

Thus 7,033,600 cubic feet of gas, which cost them £879 4s., were replaced by 95,470 units of electricity, which cost £2386 15s.; the cost of electricity thus supplied to the consumer being 2·71 times the amount he originally paid for gas, which it has superseded. It may, and will, be argued, probably even by the consumers themselves, that they get additional light for the extra money; and perhaps in a practical way they do, for, being principally composed of the shopkeeper class, there can be no question that their goods can be better displayed, and shown to greater advantage, when the light is placed near to them, as it can be with the electric incandescent lamp, than if the same light has to be kept at a distance, as in the case of gas. But, light for light, the theoretical proportional cost of gas to electricity is confirmed in a remarkable manner by the actual cost, as shown above.

Taking 4 watts per candle, one unit of electricity yields a light of 250 candles, or 250 candle-hours. One thousand cubic feet of 19-candle gas, burned at the rate of 5 cubic feet per hour, gives a light of 3800 candles (1000 × 19 ÷ 5) or 3800 candle-hours:—

Cost for electricity, at 5·4d. per unit = 0·0216d. per candle-hour.
" " 19-candle gas " 2s. 6d. " 1000 = 0·0079d. " " "

The relative costs, light for light, in Nottingham are therefore—

For 19-candle coal gas, at 2s. 6d. per 1000 = 1·00.
" electricity " 5·4d. " unit = 2·73.

The theoretical and the actual cost for electricity work out as nearly as possible at the same figure, or 2·73 times in the one case, and in the other 2·71 times the cost of gas.

The equivalent to 1000 cubic feet of Nottingham gas is 15·2 units of electricity. The total output of electricity for the year, being 183,271 units, is therefore equal to 12,057,000 cubic feet of gas. The average increase in the consumption of gas over the last three years has been 27 millions a year, one of which years has been subject to electric light competition. It would thus, in Nottingham, require the establishment of rather more than two such electric lighting installations as that already in existence to be put down each year simply to arrest the yearly increase in the demand for gas before there would be any interference with the normal business of the gas undertaking.

There are two principal advantages in regard to cost of production which gas has over electricity—

1.—The capital cost of a gas installation averages about 14s. per 1000 cubic feet sold; while for electricity it is quite five times this figure for an output of equal light.
2.—A ton of coal, costing 10s., when converted into gas yields, in addition to the gas, about 6s. worth of residuals; leaving the net cost per ton 4s., from which 37,240 candle-hours of light are produced at the consumer's burner—the cost per candle-hour being 0·0013d.
3.—A ton of coal, when converted into electricity, costs 7s. 9d.; and it is completely consumed—there being no residuals. The light yielded is, however, 41,300 candle-hours; the cost per candle-hour being 0·0022d., or 70 per cent. higher than the cost of gas.

The margin of difference in these two items is so enormous that they are never likely to approach an equality, however much improvement be made in the methods of production of electricity, for whatever margin for economy of production there may be as regards the latter, the economy in production of gas has by no means reached finality; and it is extremely likely to continue to hold its own in the future in this respect, as it has done in the past.

The case is, however, different when the supply is derived from a private installation, and the great cost of distributing mains is dispensed with. As has been pointed out by two of your past Presidents, it is possible, in a private installation large enough to require 100 lights, to produce a supply of electricity at as low a cost as for gas, especially when the motive power is the town gas. The cost of a private installation for 170 16-candle power lamps (the dynamo driven by a gas-engine), just completed and put to work in Nottingham, is as follows:—

12-horse power gas-engine (20-horse power on brake), fixed, including anti-fluctuator, tanks, &c.	£156	0	0
Dynamo	88	0	0
" slide-bars	3	10	0
" fly-wheel and extra bearing	12	0	0
" foundation bolts	3	0	0
Switchboard, volt and ampère meters	15	0	0
Bed-stones and foundations for engine and dynamo	14	10	0
	£292	0	0
Cost of 170 lamps and wiring premises, at 17s. 6d. each	148	15	0
Total	£440	15	0

The average capital cost, per 16-candle power lamp, including internal fittings, is £2 11s. 10d., as against £4 9s. 6d., the capital cost per 8-candle power lamp for the town installation, which does not include fittings. The guaranteed cost for power is not to exceed 1s. 2d. per hour; the actual cost being expected to be below 1s. per hour.

These 170 16-candle power lamps will absorb 10·88 units of electricity per hour, the cost of which for power alone will be somewhere between 1d. and 1¼d. per unit. For 170 gas-burners, at 5 cubic feet per hour, the consumption would be 850 cubic feet of gas per hour, the cost of which would be 2s. 1¼d., as against 1s. 2d. when converted into electricity.

All these comparisons with gas have been made on the basis of the light emitted from the ordinary batswing or fishtail burner having an efficiency of 3½ candles per cubic foot of gas. But if they were made on the basis of the light emitted by the incandescent mantle, with an efficiency of 14 candles per cubic foot, they would put the electric light, from a cost point of view, out of the comparison

altogether, and limit its use to confined places where the products of combustion of gas are deleterious.

Though we have now reached the period of practical development of the electric light, and are able to measure its cost and efficiency to a nicety, we are still capable of receiving new shocks of a startling nature, which, if they bore the stamp of sober credibility, might give us occasion to review our present unassailable position. But inasmuch as we have grown accustomed to startling sensations of a similar nature in times past, the worst development is hardly likely to cause us any serious alarm. It has been stated in a recent telegram from America that "Mr. Tesla has discovered a method of inducing millions of etheric vibrations per second within a vacuum tube, without using any direct electrical connection, by which an ordinary 16-candle power bulb can be made to give a light equal to 250 candles, which is sufficient to illuminate very pleasantly a large room. Its commercial efficiency is three times as great as that of the prevailing system; and there is still an ample margin for further improvement." The "margin for further improvement" is the saving clause with respect to the electric light; and though it is now said the word "impossible" has been eliminated from the electrical dictionary, the above announcement, startling as it is, need not cause a moment's anxiety or uneasiness to the gas producer, if we are to judge from the experience of the past ten years.

The price of coal has continuously fallen since the spring of 1894; and though this year's contracts have been let at something like 1s. 6d. a ton above the low prices ruling in 1887-8, it is doubtful if much of the coal now brought to the surface leaves any profit to the colliery owner. The colliery working expenses have gone up since 1889, both in wages and material, so as to leave the net price realized for the coal, after deducting working expenses, at something like the 1888 figure. That large losses are being made by many of the colliery owners is indicated by the number of collieries which have had to shut down during the last twelve months; and I fear many more will have to follow.

The gas industry has been charged with beating down prices below a living level in former times—unjustly, I think; but whatever may have been its sins in this respect in the past, I believe there is one unanimous feeling throughout the country, that no permanent good results from a cut-throat competition such as is now going on in the coal industry. We, at any rate, are entirely free from blame in regard to the low selling prices of coal to-day, which are simply the result of the policy of bringing to bank more than the market can consume. What is wanted by the gas industry is stability in price, free from the disturbing fluctuations which have been so prevalent during the past eight years, alternately necessitating the raising and lowering of the price of gas. Neither we, the producers, nor the consumers have any interest in seeing colliery after colliery squeezed out of existence by the arbitrary law of competition; and we should be well content if an understanding could be come to between masters and men by which the price of coal could be fixed at a stable figure, such as to ensure a reasonable profit to the one and fair remuneration to the other commensurate with the risk he runs. The lower price of coal, accompanied by the steady increase in the demand for gas, has, in spite of the higher wages now almost universally paid to the gas-works employés, been the means of bringing back the price of gas to the same, or even to a lower, level than that charged prior to 1890; and had it not been for the extraordinary drop in the market value of sulphate of ammonia, still further reductions would have been possible.

The principal event of the year in regard to residuals has been the phenomenal drop of 33⅓ per cent. in the value of sulphate of ammonia, due, not to any falling off in the consumption or to any considerable increase in production, nor is it due to any unusual competition with nitrate of soda, the price of which has kept steady throughout the year at about £8 per ton port value. The fall seems to have been brought about entirely by "bear" operators taking advantage of the weakness and entire absence of united action amongst producers to sell forward at low prices in the certainty of being able to cover their engagements at their own price when the time arrives. This exploiting of the market by the middleman, whether it tends to the injury of the producer at one time, or to the fleecing of the consumer at another, is alike injurious to the best interests of the trade, to the popularization of sulphate as a fertilizer, and to the maintenance of steady values for the article. The question as to whether it can ever be seriously prevented, or its baneful effects modified in some degree, is one of great interest, and is particularly pressing at the present moment. The weakness of the position from the producer's point of view is the readiness with which certain manufacturers can be induced to place their forward makes at a shilling or two above the current market values; thus discounting any possibility of a rise, and practically fixing prices for the future. So long as this continues, the speculator can pocket the orders as they arrive, and use the forward sales as a lever to force down the prices of the day to a still lower level. Practically, he holds us in the hollow of his hand.

The remedy for this is for makers to resolutely set their face against selling portions of their make forward; to put the material on the market as it is produced; and to endeavour to cultivate the home trade with the consumers direct, or with the local manure manufacturer. Another remedy is to establish a more intimate relationship between manufacturers, to facilitate the exchange of information as to what each is doing and what prices are being obtained. The sulphate manufacturers are not so numerous but that it should be easily possible to effect some better understanding and more united action among them; and for this purpose an Association was formed about twelve years ago, to which not a few of our members are subscribers. This Association is, however, by no means an unqualified success. The members do not take the interest in its proceedings, and do not attend its meetings, as, in my opinion, they ought to do. The usefulness of the Association is quite undeveloped, and mainly confined to the issue of a weekly circular giving approximate market values and quantities and destination of sulphate shipped week by week. At the close of our proceedings on Thursday afternoon, there is to be a meeting of the Sulphate Manufacturers' Association, which I hope every member of this Institute who is also a member of the Sulphate Association will attend, and give us the benefit of any suggestion he can make as to how its influence for good can be developed.

One consolation to be derived from the fall in the price of sulphate is that the home agriculturist has been able to use it to a larger extent than ever before known; and our interest is to encourage him in every possible way to further extend its application. It has always appeared to me to be a reflection on the English agriculturist that something like eight-tenths of the sulphate produced in this country has to seek its use abroad. For the first time it has had a fair trial at low prices; and it is to be hoped that we may now rely on a permanent annual demand for it at home on an increasing scale.

While ammonia has gone down, there has been a very encouraging advance in the price of tar and its products, though with regard to the latter the increase has not been very willingly granted by the distiller; and in some parts of the country there has been such a strong determination evinced to keep down the price of tar, as to produce a counter-action on the part of the gas authorities in the direction of establishing distilling works of their own. The process of tar distilling is a simple one, requiring inexpensive works, and there is a ready market for the crude products; so that if the tar distiller finds himself met with a more general establishment of product works by gas manufacturers in the future, he has only himself to blame. There is, I am quite sure, no desire on the part of the gas manufacturer to add to his already sufficiently complicated processes the additional one of tar distillation, unless forced into it by some combined action of the distillers to keep prices below what is reasonable and sufficient to ensure them a fair profit. Already a number of gas-works have put down plant; and if reasonable prices cannot be obtained except in this way, there is certain to be a large increase in the number who will follow on the same lines. The question may be asked: What is a fair profit to the tar distiller sufficient to cover his risks—fire, explosion, and fluctuations of market values? After allowing all working expenses, and providing for the proper wear and tear and maintenance of his works, he should, I think, have 10 per cent. interest and profit on his capital invested, and a further 10 per cent. to be set aside for sinking fund purposes and as insurance against risk. These two together would average about

half-a-crown a ton for a 10,000-ton plant, and should be a sufficient and liberal allowance for the purpose. So long as these figures were not materially exceeded, there would be no reason for the exchange of responsibility with him by the gas producer.

On this basis, the following are the approximate tar values per ton since 1890, when the carriage on the raw material does not exceed 2s. 6d. per ton :—

Year.	Price per Ton.
1890	30s.
1891	35s.
1892	28s.
1893	20s.
1894	21s.
1895	26s.
1896	30s.

When a tar distiller's works are situated between the gas-works and a seaport, he can afford to give a still higher price for his tar, as there is a considerable margin of difference in the cost of carriage on the raw material as compared with the manufactured product; the cost of carriage on some of the products being more than double that on the tar.

The process of distilling is so well understood by those who have practical experience in it, that it is not a difficult matter to arrange a basis for a sliding-scale which would ensure to the seller the full market value of his residual, and to the distiller a safe investment for his capital. It is the fluctuation of the market and the uncertainty of his tenure which makes the distiller so reluctant to give the full value of the tar. If he can be relieved of the risk of the former, and given security of tenure for a reasonable number of years, both buyer and seller will be mutually benefited—the one will get a higher price for his tar, and the other a steadier and more dependable income from his business. It is in this direction of the sliding-scale already operating with great advantage in a number of towns that I would point, in the interests of both, as a remedy for the unsatisfactory relationship which now exists between the gas-works authority and the tar distiller, rather than to the arbitrary step of establishing competing works and adding to the responsibilities which are already considerable.

With regard to our third residual—coke—it has, at the moment, scarcely a redeeming feature, being little more than a drug on our hands. So long as the price of coal remains low, I am afraid there is little cause for hope of improvement. The water-gas plant may, in the future, relieve us of some of the surplus; and something more might be done to popularize its use and increase its sale by paying greater attention to its preparation to suit the wants of various classes of consumers. Coke is required in many sizes. The maltster, the cement maker, and the iron smelter require it as large and hard as it can be got; but for the engineer and the smith, a large coke is quite unsuitable. They require something altogether different; and the householder requires another kind. By preparing a coke specially to suit each class of user, sorting, sizing, washing, and purifying it, a better average price can be obtained, and its consumption will be increased. As an illustration of what can be done in this direction, I may mention that the market for Nottingham cut coke extends as far as Brighton; and that recently a parcel has been shipped for use in South Africa, which, if ultimately destined for Kimberley or Johannesburg, will, by the time it reaches there, approximate to the value of its twin sister the diamond, or to that of the native gold ore of the Dutch Republic for which it is to be exchanged.

It is not an easy matter to keep pace with all the improvements which tend to cheapen the cost of the production of illuminating gas, to develop its use, to determine its quality, or to detect its presence in minute traces in places where it becomes a source of danger; for these follow each other in almost bewildering frequency. It is, however, desirable that in a presidential address we should mark some of the most influential of these improvements, in order to chronicle the steps of progress which are continually being made.

To cast a glance back over the last twenty years, it is almost impossible to point to a single process of manufacture or to a single portion of apparatus which has not been improved and developed in a degree which, compared with that previously in use, can scarcely be described otherwise than as revolutionary. Probably no portion of gas apparatus has received more attention during the last twenty years than that devoted to carbonizing. The method continues to be the same, if we exclude the production of carburetted water gas under this heading. But the apparatus employed has been so improved and developed as to be almost unrecognizable in comparison with that in operation twenty years ago. This period has welcomed the introduction of gaseous firing to the retort-setting, which, in most of the larger works, has already elbowed out of existence the old method of direct firing. By the substitution of gaseous firing for direct or solid-fuel firing, and especially when accompanied by regeneration, or the utilization of the heat of the effluent gases for raising the temperature of the air used in the secondary combustion, great economies have been effected. More regular heating of the retorts has been obtained, resulting in a prolongation of their life and a consequent reduction in the cost for wear and tear, in an increased output of gas on the same area of ground—often amounting to 100 per cent. of that previously turned out by the old system (thus doubling the capacity of a retort-house without extending the building)—in diminishing the fuel consumption to less than one-half that previously used, and at the same time diminishing by about three-fourths the labour necessary to feed and clinker the fires, and to clear away the ash. It has been said that the man who can make two blades of grass grow on the ground previously occupied by the growth of one, is the greatest benefactor to mankind. So far as diminishing the consumption of fuel used in the production of gas is concerned, this has been more than accomplished within the last few years; and the new system has been the means of placing at the disposal of the gas-works authority, for sale each year, thousands of tons of coke which was formerly consumed in heating the retorts. The joint advantages of the gaseous system of firing cannot be measured by a saving of less than 2s. per ton of coal carbonized, or about 2½d. per 1000 cubic feet of gas made.

The system has been very widely adopted in nearly all the larger works of the country; but it still remains for many of the smaller works to take advantage of it. Gaseous firing can, however, be applied with equal relative advantage to the small works as to the large; and settings of three, two, and even one retort can be heated in this manner with such economies as will repay the cost of the alteration twice over in one life of the retorts. The principle has been still further developed in its application to the inclined retort, by which all the advantages of gaseous firing are combined and accompanied by a considerable saving in labour employed in the process of carbonizing. This inclined retort system is especially well adapted to the moderate-sized works where full employment cannot be found for carbonizing machinery. But as the form of construction is more expensive, and the wear and tear heavier, than in the ordinary retort, it will not compare favourably with the horizontal retort of the ordinary regenerator setting, *plus* power machinery where such can be fully employed.

Of machinery it is scarcely necessary to say much, as, among the modern improvements, it has had a more extended life than either the regenerator setting or the inclined retort. Just struggling into existence twenty years ago, it has made steady progress in retort-house work ever since—taking sometimes one form and sometimes another, but never, except in the early stages, being abandoned for a return to hand work. In the period of development, we have had the application of steam used direct in the form of a blast, hydraulic power, compressed air, steam acting on a ram, the wire rope, and the gas-engine, as motors for driving stoking machinery; and we have now apparently settled down into a steady competition between the two forms of pneumatic power—viz., compressed air and hydraulic pressure, both greatly improved in the application since their first introduction, and likely to run each other a close race in the future.

The introduction of machinery as a means of relieving the stoker of the arduous strain involved in carrying on his heavy work under conditions of extreme heat, cannot be looked upon but with satisfaction both by employer and employed, since it enables the work to be better and more cheaply carried out in the first instance, and often allows a higher rate of wages to be earned in the second, while the stoker is able to carry on his work under greatly improved sanitary conditions and with vastly less strain on his physique than was possible under the old system of hand stoking. Moreover, as machinery for carbonizing purposes is mostly introduced into new retort-houses

constructed to meet the increasing demands for gas, its adoption seldom results in depriving any old *employé* of his work.

In addition to these improvements, some of the most modern retort-houses have been fitted with appliances for dealing with the coal as it leaves the truck on arrival at the works, carrying it through all its stages of carbonizing, removing the coke from the retort-house, quenching it, sorting, sizing, and loading it into trucks ready for leaving the works again without once being touched by hand in the process. Where this is in full operation, the reduction in cost is fully another 2d. per 1000 cubic feet of gas made; making a total saving of 4¼d. per 1000 cubic feet in the cost of production in the retort-house alone, due to modern invention and to the enterprise of the practical engineer.

The last few years have seen the introduction into gas-works of plant for the manufacture of carburetted water gas, which certainly modifies in a material sense the old methods of carbonizing, and bids fair to become a valuable supplement to the retort in most of the larger works. It occupies much less space for the same output of gas, and can be put down at a lower capital cost than retorts; but so far as the cost of production of the finished gas is concerned, there does not appear to be much, if any, economy. It, however, offers many advantages which cannot altogether be put into money value, but which must tend in the direction of economy, providing there is no material increase in the market value of oil. The facilities with which the apparatus can be put into operation, and the larger volume of gas which can, in the course of a few hours, be turned out, are advantages which, in all towns subjected to periodical and sudden fogs, the gas manufacturer will appreciate in the highest degree. If for no other purpose than as a reserve to meet such emergencies, there is likely to be a growing demand for water-gas plant. But there is still another advantage which it possesses. The water-gas plant is a consumer of coke, and capable of dealing with large quantities of this in the depth of winter, when its rapid accumulation becomes a source of anxiety and a nuisance. By putting the plant into operation in the depth of winter, two purposes are served—the increase in the volume of gas required is readily obtained, while the accumulated coke stock is actually lessened. Though carburetted water-gas plant is likely to find a home in every large and moderate-sized gas-works, there does not appear to be the same scope for it in works of smaller magnitude, unless it be accompanied by a large increase in the storage accommodation for gas. Attempts are, however, being made in the direction of adapting it for small works, which, if successful, as I trust they may be, will prove of no small advantage, especially in those cases where the works are situated at remote distances from the coal-fields.

No other portion of a gas-works offers so much scope for a reduction in the cost of production as the retort-house; but in the other processes there have been valuable improvements both in the methods employed and in the apparatus used.

Without going into wearisome detail, I may point to the economy in purification by the admixture of small quantities of air or oxygen with the crude gas, which facilitates the removal of the sulphur impurities, and increases the efficiency of the purifying material—to the praiseworthy efforts which have been made during the last twenty years to accomplish complete purification in closed vessels, which, however, up to the present have only met with partial success, but which I am satisfied will ultimately become successful, and be the future method of purification of coal gas. The recovery of the cyanogen compounds is a new feature in gas purification, which will, in all probability, prove to be the means of adding another commercial product to the industry, tending to still further diminish the cost of production.

As an indirect means of still further lowering the cost of production, we have the entirely novel and successful improvements which have been made in gasholder construction, the inventions of Messrs. Gadd and Pease, whereby the capital cost has been much reduced both with regard to new holders and in the enlargement of existing ones. The wire-rope system of guiding gas-holders, which is the particular invention of Mr. E. Lloyd Pease, and about which we are to have a paper by that gentleman later on, appears to offer a wider field of usefulness than the spiral guiding system of Mr. Gadd, as it is not only applicable to entirely new gasholders, but is especially adapted to the enlargement of existing ones, whereby the storage capacity can be increased at only a fraction of the original capital cost. At Nottingham, we have lately nearly doubled the capacity of four holders on this principle; converting them from two lifts into four lifts, and sending the upper lift out beyond the guide-framing, exposed to all the elements of nature. The original storage capacity cost £35 per 1000 cubic feet, which includes tank and holder; while the additional storage cost only £7 per thousand feet, or one-fifth of the former expenditure for this purpose.

In these days of gigantic gasholders, constructed of iron and steel, it seems almost incredible that wood could ever have been used on a considerable scale as a substitute; but through the kindness of Mr. James Whyte, of Seaham Harbour, I have been furnished with particulars of some gasholders constructed of wood which he took out so recently as 1875. We are all, of course, familiar with the application of wood and iron framing used in the construction of rectangular gasholders in the days of Accum, and during the infancy of gas manufacture; but these pigmies stand in relation to the Seaham Harbour holders in somewhat the same proportion as the latter do to the giants of to-day. From a historical point of view, it is desirable that such an application of wood should be recorded; and in the hope that the information may prove of general interest, I venture to give a brief description of these wooden holders.

They were constructed in the early fifties, 24 feet diameter by 15 feet deep, in the shape of an ordinary tub; the top and sides being composed of 5½ in. by 1½ in. boards, closely fitted together and taped in the joints. The top was curved, and the boards finished flush with the sides, so as to prevent the accumulation of wet. The side boards were held together with 4 in. by ⅛ in. iron hoops, having tightening screws to pull them together. As might be imagined, they were only moderately tight, and had to be kept well coated with tar and pitch, which, by the time they were pulled out in 1875, had accumulated to a considerable thickness. For your information, I have here a sample piece of one of the side timbers, which, since it ceased to be a component part of a gasholder twenty years ago, has done duty as a fence. It is to-day apparently as sound as when it was first used, and is a standing testimonial to the valuable preservative properties of coal gas. These holders were engineered by a local carpenter, who must, I think, have been near kin to a shipwright, to have conceived the idea of putting timber to so interesting a use.

In distribution, no less than in manufacture, there are important improvements to chronicle. The enormous development in the use of gas for cooking and heating purposes has necessitated a considerable increase in the day pressure which has to be maintained on the distributory plant; but though leakage and pressure have a close alliance to each other, the increased pressure almost universally supplied within the last few years has not been followed by a rise in the leakage account, owing to the greatly improved condition of the mains and service-pipes.

The invention of the penny-in-the-slot meter has opened up a new sphere of usefulness for gas, and broadened the basis of its popularity. It is marvellous to witness the eagerness with which the working-class population take up this prepayment system of supply, and how they cling to it when the gas is once laid on. Apparently it raises their social status, and carries with it many comforts and conveniences to which they have long been unaccustomed. With no special effort, and in the absence of all artificial inducements, more than a thousand of these meters have been fixed in Nottingham within the last year; and the addition to the consumption from this class alone is now nearly 30 million cubic feet of gas a year.

With the object of controlling, regulating, and maintaining a steady pressure in the district at all periods throughout the 24 hours, Mr. William Cowan has devised an electrical apparatus which automatically comes into operation whenever a change in the pressure of gas takes place. This, by means of electric wires, communicates with the governor, and quite automatically puts on or takes off pressure, according to requirements. It is likely to prove a most useful instrument in connection with the distribution of gas; at all times ensuring an adequate

supply to the district, but never permitting a greater pressure at any time than is sufficient for the purpose.

While recording the progress which has been made within the last twenty years in the manufacture and distribution of gas, we must not lose sight of the advances which have been made in the burners by which its usefulness has been so enormously increased, and its efficacy as an illuminant so much improved. The incandescent burner and mantle has, at one jump, quadrupled the volume of light from a given quantity of gas. There have been many other improvements, though of minor importance, but all travelling in the same direction of increasing the effective light which can be obtained from the gas.

During the year there has been a steady growth in the number of transfers of gas undertakings from private to public control, and in the autumn of last year the "JOURNAL OF GAS LIGHTING" drew attention, in a series of short editorials, to the incidence in the capital burthen on the consumer in the two classes of undertakings; comparing the almost stationary capital burthen of the joint-stock company with the rapidly diminishing capital burthen of the municipally controlled undertaking—a matter of considerable importance to the administrators of gas companies especially, and one requiring their serious thought and consideration. In the transfer of a gas undertaking to a local authority, Parliament has imposed a condition in all cases that, out of the profits, a sum shall be set aside in the form of a sinking fund each year for the ultimate extinction of the capital; and in some of the early transfers—notably Manchester and Glasgow—the capital of the undertakings has already in this manner been reduced to something like one-half of the amount originally expended. In the case of the companies, Parliament has not hitherto permitted any such system of extinction; and all expenditure on capital account up to a recent date was a burthen in perpetuity.

The adoption of the auction clauses, and the appropriation of the premiums derived from the sale of stocks, have enabled the companies, in a limited degree, to extend their works without increasing the capital burthen on the consumer; and thus of late years there has been a slightly diminishing cost for interest in proportion to the capital expenditure of companies as well as of local authorities. But the difference in degree is very marked; and as every year will tend to increase this difference, it is a matter for the urgent consideration of all administrators of company undertakings. Mr. George Livesey, in a very able letter which appeared in the "JOURNAL OF GAS LIGHTING" on this subject, pointed out how the growing disparity might be minimized:

1.—By gradually making extensions and renewing obsolete with more efficient plant out of revenue, until the capital expenditure closely approximates the structural value of the undertaking, *plus* a sum for working capital. This he estimates should be £3 10s. to £4 per ton of coal for works of first-class magnitude; £4 to £5 for works of medium size; and £5 to £6 per ton for smaller undertakings.
2.—By the increase of the utmost economy in laying out capital on additional works.
3.—By the raising of a new stock at the lowest possible rate.
4.—By the issue of debenture stock which can be raised at about 3 per cent. up to the full maximum of one-third of the total paid-up capital of the company allowed by Parliament.

In these ways, he thinks it would be possible to lower the interest charge for capital to between 6d. and 8d. per 1000 cubic feet of gas sold; and if this be done, companies need have little fear of comparison with municipal undertakings.

It will, I think, be admitted that these are all suggestions which have been too little acted upon in the past; but if they are carried out to the full extent proposed by Mr. Livesey in the future, they are not a solution of the difficulty, but merely a postponement of the inevitable disparity, as will be shown by the following figures:—Of the total capital employed by the companies in 1883, 96·8 per cent. was interest-bearing in some form or other; the remaining 3·2 per cent. being derived from premiums on the sale of stock on which no interest is allowed to be paid. In 1893, the interest-bearing capital was 94·4 per cent. of the total; the difference being premium capital bearing no interest. This shows a diminution of 2·4 per cent. in the ten years. In 1883, of the total capital employed by the local authorities 85·8 per cent. was interest-bearing; and in 1893 this had fallen to 78·5 per cent.—or a diminution of 7·3 per cent. in the ten years.

The usual sum set aside for sinking-fund purposes is about 1 per cent. on the capital expenditure of local authorities; and at first sight the diminution of 7·3 per cent. on the interest-bearing capital of the local authorities in ten years appears to be a small amount, and so it is. But this is due to the transfers of gas undertakings to local authorities, which are continually taking place, where interest has to be paid on the whole cost of transfer—*i.e.*, on 100 per cent. The same influence is, however, at work on these newly-acquired undertakings; and the tendency is in an increasing ratio in a downward direction to the point of complete extinction.

Already the interest-bearing capital of local authorities has fallen for the whole country—large and small undertakings included—to an average of £4·61 per ton of coal carbonized, or to a little above the minimum at which Mr. Livesey deems it possible to reduce the capital for works of first-class magnitude; while the interest-bearing capital of the companies is all but stationary at £5·94 per ton of coal carbonized. The difference in the two figures becomes the more significant, when the high capital value always paid by a local authority on the acquisition of a gas undertaking is borne in mind—the most recent one being that of Chesterfield, for which the new authority paid £19·33 per ton of coal carbonized. To pay their dividends and interest on loans and debentures, the companies now require 12·39d. per 1000 cubic feet of gas sold; while the local authorities need only 8·92d. per 1000 feet to pay all interest charges, to provide a sinking fund for the ultimate extinction of the capital, and to cover the large surpluses which in many cases go towards reduction of the rates.

The appropriation of a portion of the profits of a gas undertaking to the relief of the rates is a fruitful subject for criticism, as is also the custom of calling upon the present consumer to pay, in addition to the interest on capital, a sum towards the extinction of that capital, the benefit of which will be reaped by the next generation. However much these two points may be open to the criticism of the disinterested, surely the injustice—if injustice there be—is on the side of prudence; and in the face of rapid scientific development in the direction of competing sources of light, it is a wise prudence which sets aside a portion of yearly income to provide for such a possible contingency as complete supercession, and particularly so if this can be done with less burthen to the consumer than if he undertook no risk but had to pay higher charges for others to undertake it for him.

In seven years to 1893, the interest charges have fallen in the case of company supply from 14·04d. to 12·39d. per 1000 cubic feet of gas sold—a diminution of 1·65d. per 1000 feet in seven years. During the decade of 1883-93, the interest charges have fallen in the case of local authority supply from 14·79d. to 8·92d. per 1000 cubic feet of gas sold—a diminution of 5·87d. per 1000 feet in the ten years. In round figures, the burthen of capital charges for interest has diminished by 2¼d. per 1000 feet in ten years where gas has been supplied by companies; while it has been lessened by 6d. per 1000 feet in the same period where the supply has been under municipal control.

In the future, the decrease in the capital burthen on the consumer who takes his supply from a public authority is likely to be more rapid; and a time is not far distant when the decreasing cost of production will put the company supply almost out of comparison, even though it carries out its future extensions and developments on the ultra-philanthropic lines suggested by Mr. Livesey, which it would be hardly reasonable to expect. When an individual or a company is deprived of all advantage from further development, its interest in future extensions is gone, and the business will most certainly cease to grow. That town will offer the greatest inducement to the establishment of commercial industries, which can give a cheap gas supply and maintain a high standard of sanitary perfection. The ultimate extinction of capital on its gas undertaking ensures it the one attraction; and the other may be left to the wisdom and foresight of its municipal legislators.

There is one other matter of importance to which I wish to draw your special attention. In the exciting times of turmoil and change through which the Institute has passed

since 1886, the existence of the Benevolent Fund has, I am afraid, been very much lost sight of and neglected by the great majority of members; and I now wish specially to bring back to your minds the fact that such a fund exists in connection with the Institute, and requires your assistance and support. It will be within the recollection of many of the older members as to how this fund originated; but, inasmuch as many changes have occurred in the constitution of the Institute and in its *personnel*, since the formation of the Benevolent Fund, it may not be out of place if I refer briefly to its past history.

For many years before the existence of the British Association of Gas Managers, periodical appeals for assistance were made through the Press in aid of distressed members of the gas profession; and the need for some such fund as that now administered by the Institute was a much-felt want. On more than one occasion, to its credit, the "JOURNAL OF GAS LIGHTING" had advocated the formation of such a fund; and so long ago as 1856, it drew the special attention of its readers to the question. Nothing, however, appears to have been done immediately; but the necessity for such a fund was particularly emphasized in 1862, when a general appeal was made on behalf of the widow and grandchildren of the late Samuel Clegg, the well-known author of the "Treatise on Coal Gas;" the "JOURNAL OF GAS LIGHTING" referring to this effort in the following words: "The recent effort to raise a fund for the benefit of the widow and grandchildren of the late Samuel Clegg discloses in a marked manner the want of a provision for the relief of aged and decayed officers who have been engaged for a great part of their lives in the manufacture and distribution of gas." Up to this time, however, there was no organized body to take the matter in hand; and any efforts which were made to provide assistance in special cases had to be made through the medium of the Press. In 1868, Mr. T. G. Barlow, the proprietor of the "JOURNAL," became also President of the British Association of Gas Managers, and, in his presidential address, he gave the matter his warm support, which resulted, in the following year (1869), in Mr. W. J. Warner formally moving a resolution that such a fund should be established. This resolution did not, however, commend itself to the meeting; and it was afterwards arranged that proper notice should be given, and that a more matured proposal should be brought forward the following year. Mr. Warner again championed the cause; and, as a result, he succeeded in getting a Committee appointed to investigate the whole matter and report at the succeeding meeting. This Committee made inquiry by circular as to the feeling of the members; but they were unable to recommend that the matter should be further proceeded with.

In 1872, Mr. Jabez Church again drew attention to the subject in his presidential address, and stated that a number of gentlemen had offered large sums as donations towards the establishment of a fund, if the Association chose to undertake the task of its formation and supervision; and among those gentlemen who had made offers was Mr. Alexander Angus Croll, who proposed to contribute £100 to the fund. In the following year, Mr. Croll became President; and, at his instigation, further inquiries were made. A Special Committee again investigated the matter by means of circulars; and, at the conclusion of their inquiry, they reported that in their opinion they did not consider the responses sufficiently favourable to justify them in recommending the formation of a fund. Mr. Croll, however, was not to be baulked in his benevolent intentions; and the £100 which he had set aside for devotion to the Benevolent Fund he now begged the Association to accept, and invest in such a manner as a small Committee might think fit, so that the interest arising from this sum might be devoted to an award of a special premium for meritorious papers which might come up for consideration at the annual meetings of gas managers. This donation formed the nucleus out of which the President's Medal and the premium awards are made to-day.

So far as the Benevolent Fund was concerned, the matter lay dormant for three years, until, in 1876, Mr. Robert Morton announced in his presidential address that a report on the subject would be read at the termination of the proceedings of that year, and a resolution would, as a consequence, be moved. The report stated that definite promises had been received from 93 members to contribute £94 3s. 6d. per annum as annual subscriptions, and that, in addition to these definite promises, there were certain other conditional ones which would make it possible to rely on the sum of £100 a year being available for the purposes of the fund. This report was considered to be so satisfactory, that it was adopted by an overwhelming majority of members; and rules were ordered to be drawn up on the lines of the Benevolent Fund of the Institution of Civil Engineers—stipulating that donations and bequests should be treated as capital, and that the interest arising therefrom, together with the annual subscriptions, should be income out of which necessitous and deserving cases could be helped. The rules were drafted, approved, and adopted in 1877; and the then President announced that 31 donors and 125 subscribers had promised to contribute no less a sum than £838 8s. to the fund. Successive Presidents gave the development of the scheme their warm support; and when the fund had reached £908 0s. 11d. in 1880, the first grants were made, amounting to £78, which was divided among four recipients. Since then various sums have been distributed annually, ranging from a maximum of £189 2s. in 1886 to a minimum of £50 in 1893, which curiously happened in the years in which our late esteemed colleague, Mr. Denny Lane, occupied this chair. From the formation of the fund, there had been no less than 34 distinct cases of urgent need relieved; and a total sum of £1997 18s. had been distributed up to the end of 1895, which gives an average of £133 per annum.

The available balance of capital and interest continued to increase up to 1894, when it reached its maximum of £1814 14s. 5d.; but the subscriptions rapidly declined from 1886, when they were £154 15s. 6d. until they reached a minimum in 1894 of £38 6s. 6d. only. As a consequence of this great falling off in income, the Committee who have charge of this fund have had to materially diminish the amount of the grants in face of many distressing applications such as were more liberally dealt with when the fund was in a better condition. There is no doubt that the great falling off in subscriptions and contributions was due to the shock which the Institute received in 1886, which led to the regrettable withdrawal of so many of its influential and affluent members—a shock which, for a brief time, staggered the Institute, nearly paralyzed its usefulness, almost ruined its finances, and very much restricted the beneficent work it had commenced in connection with this Benevolent Fund. Fortunately, Time—the great healer of all troubles—has enabled the Institute to recover itself; and now, with an annually increasing membership, and a complete restoration of the full powers of usefulness, it is, I think, high time that we should once more turn our attention to the development of the charitable side of our institution.

I ask that the meeting which is to follow on the close of the proceedings this afternoon shall be attended by as many members and associates as can make it convenient to stay, so that they may hear what is the position of the fund, and how the business in connection with it is conducted, and then, I trust, we may have largely increased annual contributions; and I also venture to hope that we may be fortunate enough to receive donations sufficient to lift the invested capital from £1515 at which it now stands, to at least £2000, so that the interest from this and from the annual subscriptions might place a sum of not less than £200 a year in the hands of the Committee, to enable them to carry on the beneficent work which has only been suspended for a time in consequence of the diminished funds at their disposal.

When help is given, it requires to be given promptly, and in such sums as can be utilized to advantage; and no good is to be derived from the distribution of only a few pounds at a time, which may not be more than sufficient to cover the funeral expenses of a deceased member. I therefore make an earnest appeal to all members and associates that they should contribute at least something towards this fund, which has hitherto been used to relieve the necessitous, whether they have been subscribers to it or not in the past. Though we may hope the time will never come when any of the present members may require this assistance, the necessitous and the unfortunate are always with us, and most frequently in the form of the widow and orphan who have been left without adequate provision; and it is on their behalf that I venture to make this somewhat pressing appeal.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1281.)

THE past week presented some chequered phases so far as the Stock Exchange is concerned. It opened active and buoyant enough; showing a bright tendency in many quarters. Sound and solid investments like home rails were strong; while, in the more sporting department, South Africans had quite a boom, in view of the intelligence of the release of the prisoners. But very soon after the spurt, there was a run the other way to realize; which put a stop to any advance. The next incident was the Derby, followed by the Oaks; and the attractions of Epsom much interfered with those of Capel Court, so that, for the rest of the week, the markets relapsed into a state of quietude and dulness. Prices in the chief departments have thus undergone no great change. The Money Market was in its old condition of extreme ease. In the Gas Market, there was considerable activity in the earlier portion of the week; but it dwindled away gradually, until at last the market sank into a state of extreme quiet. The general tendency was decidedly good, and remained unimpaired to the end, in spite of the restricted business. Gaslight issues were in excellent favour. The "A" showed its quality at once, and was briskly done at an advance of a couple of points; the highest figure of the week—314—being attained on Thursday. A few transactions were marked in each class of the secured issues—debenture, preferred, and limited—and good prices were realized, although no advance was scored. Not much was done in South Metropolitans; but all three issues of capital stock commanded nice prices. Commercials were quite neglected; not a single transaction being marked in them. Among the Suburban and Provincial Companies, the only one dealt in was Brentford, where a transaction sent the old stock up three points. Business in the Continentals was rather quieter; but they were strong generally—Imperial making a fair advance, and Union commanding top price more than once. None of the rest presented any noteworthy feature; and no variation occurred in their quoted prices. The Water Companies were rather quieter even than usual; some days being almost absolutely blank. The tendency, however, was decidedly favourable; and New River and Chelsea scored an advance.

The daily operations were: Business in the Gas Market was fairly active on the opening day; but it was to a great extent confined to Gaslight "A," which was in good demand, and advanced 2. In Water, Chelsea improved 2; and New River, 3. Activity was maintained on Tuesday—Gaslight issues and Imperial Continental having the most of it; and prices were on the rise. Brentford old improved 3; and Imperial Continental, 1½. Business grew a little quieter on Wednesday; and the only change was an advance of 1 in Imperial Continental. Thursday was about as busy as the previous day; and prices continued very firm, though they did not improve. Things became much quieter on Friday; and no change took place. On Saturday, the market was almost lifeless; and again quotations closed unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Hampstead Vestry and Electric Lighting—Mr. W. H. Preece's Estimate—The Beginning of the Venture—The Results—A Warning against Electric Traction.

ANOTHER contribution to the financial history of municipal electric lighting has been made public, in the report of the Vestry Clerk of Hampstead on the working of the parish electric lighting undertaking up to the end of last year. It has been freely asserted locally that the publication of this report was purposely delayed over the recent Vestry elections; but this idea is, of course, preposterous, and a slander on the sacred name of Progressivism, which knows nothing of such tricks. Mr. A. P. Johnson, the Vestry Clerk, who signs the statement in question, tells the whole story of the venture in a very clear and interesting style. It appears that when in 1890 the Vestry was called upon to consider, and, if approved, to consent to certain Companies' applications for Provisional Orders for the parish, the authority refused, on the reasonable ground, among others, "that no proof had been adduced that the cost of illuminating by electricity did not exceed the cost of gas, but, on the contrary, as far as could be collected, it would considerably exceed it." It is distinctly to be regretted, in the interest of the ratepayers, that the Vestry ever departed from this prudent reserve, because they have only succeeded by their own enterprise in establishing the abiding truth of this observation.

However, the report goes on to state that the speculative electricians would not let the Vestry alone in what the Clerk now ventures to stigmatize as a "dog-in-the-manger" policy; and accordingly it was not many months before the Local Authority were badgered into asking the great Mr. Preece to advise them as to what should be done in the matter. The result was what might have been expected from a proceeding comparable only to a rich client's asking a respectable solicitor whether it might not be worth while to go to law about something. Of course, Mr. Preece strongly advised in favour of a "forward policy." He estimated that for a capital outlay of £11,000 the whole parish could be lighted on the high-pressure alternating system, returning a profit of £3700 a year, or 4·6 per cent. on the proposed capital outlay. The bait was further sweetened by some references to the "political mistake" made by local authorities in selling their "birthrights" by giving up the monopoly in gas and water; and Hampstead was solemnly warned against repeating the same blunder with regard to electric lighting. Naturally, the bait took; but with a vestige of prudence it was decided to begin with a small and select area of the parish, comprising the best portion of Finchley Road and Fitzjohn's Avenue, and the immediate vicinity.

After some further delay, operations were commenced by accepting tenders which eventually ran into nearly £30,000 for laying down a 400 kilowatt plant, which was almost immediately increased to 625 kilowatts. So soon as the applications for current began to come in, it was discovered that they were not confined to the area originally arbitrarily marked out for the experiment, so that, in order to get any business at all, it was necessary to spend during the first fifteen months no less than £17,551 on main extensions. This revelation is open to the criticism that the Vestry had begun their work in the wrong place; but no consciousness of this appears to disturb the official reporter. Moreover, when the central station first started, the arc lighting in the principal thoroughfare was far from satisfactory. This was disappointing, in view of the eminent advice by which the Vestry had been governed throughout. Considerable alterations were consequently made in the arrangements for this lighting; but we notice that the experiment is still confined to the same locality.

The report asserts that "the Vestry may look back with satisfaction on the result of the private lighting for the period under review." The central station started with thirteen customers. By the end of last year the number had risen to 246, with an equivalent of 19,407 8-candle power lamps. Meanwhile, the capital expenditure had grown to £56,522, or considerably more than double the amount of the first loan—£25,000—which represented the extent of the original commitment of the Vestry to this venture. The actual loss on the working of the undertaking for the period covered by the accounts totals up to £1916, which the reporter admits to be "a large amount," but endeavours to minimize by referring to the expenses necessarily incurred before the current was supplied to consumers, and to the dead load of capital—nearly £26,000—spent on extensions of mains from which only a very little revenue has accrued. Here again the suspicion arises that this expenditure would not have been necessary if the lighting area had been more wisely chosen. These main extensions nevertheless appear to have greatly exercised the Vestry, who first found it expedient to dispense with contractors for doing this work, and shortly afterwards decided to do without the services of their eminent Consulting Engineer. Since this decision was taken, all the electric lighting work of the Vestry has been carried out by the advice and under the supervision of their own Electrical Engineer, Mr. G. H. Cottam, who has supplied for the report an instructive diagram representing the capacity and output of the station, which exhibits many curious data. He has his work cut out to make this monument of Mr. Preece's persuasive skill pay its way; and the Vestry will have an interesting experience in testing the sanguine expectations of 1891 by the reality, as time goes on.

A letter appeared in last Wednesday's "Times" from a correspondent at Kingston, in the State of New York, referring to the incessant attempts that are being made to persuade the London County Council to sanction electric traction for working the Metropolitan tramways. The writer says he wishes to strike a note of alarm in this regard; and he asserts that in all the big cities of the States the electric street car lines are a positive danger and menace to life and property. "In Brooklyn alone there have been 148 lives lost up to the present time through accidents with these cars. Over here," he goes on to remark, "the almighty dollar rules the roost, and life and property are a secondary consideration." He further denies that the underground conduit system of electric car propulsion is running successfully in New York. "The only underground system is that of the cable cars, all electric cars being run on the overhead trolley system, which necessitates the running of a bare overhead 'live' wire through the streets at a height of 18 feet above the ground, and carrying a current of immense power, to come into contact with which means instant death." There is no novelty in this communication for readers of the technical journals; but it is as well that those who peruse the ordinary newspapers should be kept acquainted with the facts of electric tramway working as they appear to residents in Transatlantic towns, where the street railway companies usually own the whole body of local administrators.

Belgian Briquettes.—The exports of briquettes from Belgium in February were 40,813 tons, as compared with 25,878 tons in February, 1895, and 41,298 tons in February, 1894. The exports for the first two months of this year were 75,408 tons, as compared with 55,856 tons in the corresponding period of 1895, and 86,843 tons in the corresponding period of 1894. In these latter totals, the exports to France figured for 35,734 tons, as compared with 23,998 tons in the corresponding period of 1895, and 31,486 tons in that of 1894.

THE LEGITIMATE AND WASTEFUL CONSUMPTION OF WATER.

At the present time, when the question of the sufficiency of the Metropolitan and other town water supplies is being argued afresh, it is worth while to notice the fact that consideration of the same problem is agitating the water-works engineers of the United States. An important paper on consumption and waste of water was read by Mr. Dexter Brackett at the last annual convention of the American Society of Civil Engineers; and the full text, with reports of the oral and written discussion, has recently been published in the Transactions of the Society.

Mr. Brackett opened his subject by observing that the annual reports of the Water Departments of the cities of the United States show that the quantity of water used has increased much more rapidly than the growth of the population, and also much more rapidly than was expected by the engineers who designed the works. In the typical case of Boston, the original water-works, constructed in 1848, were based upon the assumption that 28 gallons per head of the population per day would be an adequate supply for all purposes; this conclusion being based on the experience of the City of Philadelphia. Before many years, it was discovered that this allowance was insufficient; and when an additional supply was arranged for in 1872, it was considered that 60 gallons per head would be a proper allowance for the future. The actual present consumption of water in Boston is 100 gallons per head; and this is accepted as the proper rate by the Massachusetts State Board of Health. Great as this rate of consumption is, it is exceeded by a number of large American cities. Chicago requires per head of the population per day, 147 gallons; Philadelphia, 150 gallons; Cincinnati, 124 gallons; and Detroit, 148 gallons. A notable increase of the consumption of water in all these places has occurred during the last five years or so; and Mr. Brackett, asking himself whether the phenomenon is due to legitimate use, or to a wasteful and extravagant use of the water, expresses the opinion that, while the increase can be attributed in part to both of these causes, the greatest share is due to "unnecessary and wilful waste."

It is remarked, very pertinently, that, with few exceptions, the efforts of water supply authorities during the past twenty-five or thirty years have been directed towards securing new sources of supply and the construction of additional works, rather than towards the promotion of measures of economy in the use of the water already provided. Public opinion has always favoured the free use of water; and in most cities there prevails the well-established but mistaken idea that constant streams of water running through water-closets and house drains have a good sanitary effect. Mr. Brackett has accordingly set himself to study the causes of the great modern increase in water consumption, with the objects of determining what should be a proper allowance for the legitimate use of a community, and how waste occurs and what can be done to cure it. In considering the first question, he divides legitimate water consumption under the heads of (1) the quantity needed for domestic purposes; (2) the quantity required for trade purposes; (3) the quantity used for public purposes; and (4) the waste.

Under the first of these heads comes not only the household requirements of the population, but also the quantity of water required for provision stores, fish markets, laundries, stables, and, in short, all the needs of a residential community, with the exception of the public uses of street watering, fire extinction, fountains, and so forth. In ascertaining what these requirements mean in practice, Mr. Brackett does not indulge in *a priori* reasoning, which might prove anything or nothing, but avails himself of actual records furnished by the meter measurement of water supplied to residences in a number of towns. In one instance—that of the United States town of Worcester—the whole domestic consumption is metered. The figures work out to an average of 25 gallons per head per day for houses of a good class, provided with modern sanitary fittings. In a high-class residential suburb, where there is much lawn watering and stable work, and water is in demand for ornamental uses, the measured consumption will run up to 44 gallons per head; while a poorer population can do with little over 12 gallons per head per day. Combining all the records, which affect a total population of 232,000, the average consumption is 18·2 gallons per head. Allowing 10 per cent. extra to cover the errors of registration, it appears that 20 gallons per head would suffice for all the domestic needs of a mixed population.

The quantity of water required for mechanical, trade, and manufacturing purposes naturally varies widely, in correspondence with differences in the character of districts, and the degree in which the factory consumption comes upon the public water supply. In some places, the entire consumption is for domestic uses; in others, the quantity of water required for manufactories exceeds the household demand. Where town's water is used for manufacturing purposes, such use has a tendency to increase much more rapidly than the domestic demand. Taking the example of Boston, where the conditions both of domestic and industrial water consumption cannot be far from normal, Mr. Brackett finds that the consumption for six of the most important trade purposes, reduced to the rate per head of the population, has nearly trebled itself in twelve years. In the year 1892, steam railroads accounted for 2·26 gallons, sugar refineries for 1·70 gallons, gas-works for 0·75 gallon, electric light and power for 0·69 gallon, breweries for 0·89 gallon, and elevators for 2·95 gallons of water per head. The rapid increase of this legitimate demand for water has consequently to be reckoned upon.

The water employed for public purposes goes in a variety of ways; and when, as sometimes happens, no charge is made for some of the applications, the consumption is apt to be excessive. A careful study of the requirements of different public purposes gives the following data: Public buildings, schools, and hospitals, 2·30 gallons; street sprinkling, 1 gallon; flushing sewers, 0·10 gallon; ornamental and drinking fountains, 0·25 gallon; fire extinction, 0·10 gallon—total for public purposes, 3·75 gallons per head per day. Probably, from 4 to 5 gallons per head per day would cover all public requirements. From a study of these data, Mr. Brackett draws the general conclusion that towns do not want more than 30 gallons of water daily per head of the population for domestic uses. Manufacturing needs vary, and should be separately computed. In any case, however, they should be satisfied with a supply of about 40 gallons per head of a large town population. Water for public purposes is only about 5 gallons per head per day. It thus results that in a large city doing a considerable amount of trade, anything over 75 gallons per head of the population is to be suspected as water wasted. In the City of Buffalo, where the daily pumping amounts to 252 gallons per head of the population, the engineer of the water-works regards 70 per cent. of this enormous supply as wasted. The utmost capacity of the works has been reached in the endeavour to cope with the demand, and the people are "not in favour of meters."

Discussing the causes of waste, Mr. Brackett finds this to be due to defective plumbing, defective mains and services, water run to waste to prevent freezing, and wilful waste for a mistaken sanitary object. He proceeds to argue that the most efficient means of preventing waste is the introduction of meters, with a proper allowance for legitimate uses. He also advocates the use of the Deacon waste-water meter, and adduces a considerable bulk of evidence to prove that without the latter there is not much to be gained from the former. In one town, where every service is metered, and there was a meter on the supply-main, the registrations of consumers' meters only accounted for half the quantity passed by the main meter. In the course of the discussion on Mr. Brackett's paper, several speakers bore personal testimony to the economy of service by meter. One engineer observed that it is one of the disadvantages of a gravity supply that leaks of large amounts from the mains cannot be so readily detected as when the water is pumped. A point in favour of universal metering was made by Mr. E. Kuichling, who showed, by statistics specially prepared for the purpose in the Water Department of the City of Rochester, that where meters are extensively used, the weekly and monthly consumption of water is much more uniform than in places where meters are not used. Thus, it is claimed, the fluctuations of demand which sometimes threaten to cause a water famine are prevented. In a written communication, Mr. L. J. Le Conte points out that hydraulic elevators and motors, when supplied from town's mains, are extravagant consumers of water. Mr. Herschel advocated the use of the Venturi meter upon all trunk mains. Mr. R. Cartwright, speaking as a gas engineer, advocated the metering of water services, and argued that the outlay for this purpose would be less than the cost of the works extensions it would render unnecessary. For his own family of six persons, the meter registration on the service averages 261 gallons per day. Mr. Allen Hazen contributed a statistical table showing, among other things, that Berlin, with metered services, is satisfied with 16·37 gallons of water per head per diem. Here all the water pumped is accounted for, to 2½ per cent.—allowing a 10 per cent. slip for the pumps.

In conclusion, it must be obvious that the central question to which Mr. Brackett applies his researches—the best way of checking waste of water—presents different aspects when raised in regard to consumptions of 200 and 35 gallons per head per day respectively. There must be plenty to be done to check extravagance in the use of water in towns where the former rate obtains, before such a step as the universal metering of the house services can be regarded as universally necessary. The metering of house services may or may not be an economical, and in other respects a desirable, expedient in water supply. But it is clear that the case for it can only begin when the last word has been said for what is practicable without having recourse to this principle. This, of course, is arguing from the purely engineering standpoint, without reference to the cost of the water as supplied under any possible system. What is required to be known is, the probable economy of water to be secured by the best and most complete metering of private services as compared with the result of regular, systematic inspection of fittings, the use of none but good and proper fittings for all domestic purposes, and abolition of waste-pipes or their conversion into warning-pipes. Would the difference be worth the cost and additional inconvenience of a universal meter system? Examples such as that of Munich, where, out of a total consumption of 34 gallons per head per day, 31·30 gallons are measured to private consumers, would appear to indicate that this question might be answered in the negative.

NOTES.

The Light Efficiency of Magnesium.

Professor R. H. Thurston has been writing in an American engineering journal in support of the proposal to try what can be done with magnesium in engineering construction. Magnesium, although still a rare metal and somewhat costly, has always seemed to Professor Thurston a possible future rival of the more common metals of construction, where a combination in maximum degree of lightness and strength is essential. His work on this metal began nearly thirty years ago, with a series of experiments aiming at the production of an economical and otherwise satisfactory signal light. With regard to the quality of magnesium as an illuminant, Professor Thurston gives some interesting results of these experiments. It burns, as he says, readily, steadily, and brilliantly. Its light is very rich in actinic rays, and is so bright as to be visible, where used as a signal, at the distance of thirty miles or more at sea. The flame of magnesium has a temperature of about 1340° C.; but the light is similar to that of an ordinary flame at three times this temperature. Its radiant light-energy is 13·5 per cent.—a higher figure than that of any known flame; being equivalent to three-fourths of its total energy of combustion, and being four times that of illuminating gas. The total light-giving efficiency of magnesium is 10 per cent., as against 0·25 per cent. for coal gas; and having regard to the greater luminosity of its light rays, it has fifty or sixty times the luminous value of gas. The magnesium spectrum is nearer that of sunlight than the spectrum of any other artificial luminant known. The spectrum also indicates a close relationship between magnesium and aluminium. Professor Thurston has taken out several United States patents for magnesium lamps; but it is scarcely necessary to remark that these came to nothing. The chief apparent application of magnesium in the arts now is as an alloy with certain metals, with a view to lightening the construction of electro-dynamic machinery.

Melting Platinum in a Carbon Furnace.

The fusion of platinum in a furnace fed by carbon and air has hitherto been regarded as an achievement of doubtful feasibility; but Dr. Victor Meyer claims to have accomplished it. As is well known, in almost every flame there is a hot region having a higher temperature than the melting-point of platinum. A capillary platinum wire can be fused in the hottest part of the flame of a common candle, as well as in an atmospheric gas-flame. Yet the problem of fusing platinum in a carbon blast-furnace, in vessels perfectly closed on all sides, does not seem to have been hitherto solved in a manner free from all doubt. In the course of certain pyro-chemical investigations that have engaged Dr. Meyer, in concert with Dr. von Rocklingshausen and Dr. Locke, the task was undertaken of constructing a furnace in which platinum would fuse; while an alloy of 25 per cent. of iridium and 75 per cent. of platinum was unattacked. For this purpose, a blast-furnace was designed; the fuel being gas-retort graphite broken into pieces of the size of a hazel-nut. Under certain conditions, this furnace answered the purpose required of it; so that the fusibility of platinum in thick-sided crucibles with a carbon blast-furnace is now indubitably established.

Measuring Water Chemically.

At the last meeting of the Institution of Naval Architects, Mr. C. G. Stromeyer read a paper proposing a chemical means for the measurement of feed and circulating water, the contents of reservoirs, the flow of streams, and similar purposes. He endeavoured, in effect, to apply to water the same principle of chemical measurement which has long been adopted for determining the composition of furnace-gases. In the case of the latter, a careful analysis is made of the fuel and of the products of its combustion, as first steps to the determination of the character of the furnace-working. Complicated though this method may appear, it is more accurate than any known process of direct measurement of the gas current by an anemometer; and it occurred to Mr. Stromeyer that a similar method, if simplified, might with advantage be applied to the measurement of streams of water. The first essential to the success of any such process is the selection of a substance, to be added to the bulk of water, which can be detected in an extreme state of dilution by reliable chemical tests. Salt (sodium chloride) and its test by nitrate of soda were selected as likely to answer this purpose; and when applied in the manner described at length by Mr. Stromeyer in his paper, they gave results accurate within 0·4 per cent. A still more accurate determination could have been made if, instead of salt, the rather expensive chemical nitrate of soda had been injected into the waters. The accuracy attainable with this substance is such that the capacity of one of the Tilbury graving docks, holding about 60,000 tons of water, could be determined chemically to within 1 per cent. of its true amount. For this purpose, only 1 cwt. of the nitrate would need to be dissolved in the water, of which a few ounces would serve for the analysis. From his experiments, Mr. Stromeyer concludes, among other things, that the method can be applied to the accurate measurements of the flow of small streams, and would be of special value in mountainous districts. It being possible to determine the salinity of water holding only 1 grain per gallon in solution to within 1 per cent. of its true amount, it would be necessary to hold salt brine of the strength of 50 ozs. to the gallon, at the rate of only 1 gallon per minute, to a stream delivering 350 gallons of water per second, and to collect a sample after thorough mixing has taken place. Mr. Stromeyer thinks that the degree of accuracy attainable by his method compares favourably with that of weir gaugings.

Economy in Railway Carriage Lighting.

A proposal for rendering the gas lighting of railway trains still more economical to the railway companies than it is already, as compared with oil-lamps, has been put forward by Mr. H. T. Procter, of 43, Victoria Street, Westminster, and was noticed in our "Register of Patents" on April 21 last (p. 867). This is for the equipment of gas-lit railway carriages with an appliance of his own devising, whereby the light or lights in every compartment are turned full on automatically on a passenger taking his seat and slowly lowered (not extinguished) as soon as the last passenger leaves. It is notorious that the proportion of compartments of railway carriages that run empty is largest during the hours when artificial lighting is necessary; so that to the expense of hauling empty coaches, is added that of their unnecessary lighting. A further waste takes place on empty trains when being shunted at night, or kept waiting either in sidings or at the station platforms for half-an-hour or more, with their lights full on because it is not worth while to turn them out and light them again. Mr. Procter proposes to prevent this waste by a simple and entirely mechanical arrangement, whereby the weight of the passenger is made to act by a link movement upon the gas-cock in the roof of the carriage. It is obvious that, if successful, the appliance might receive other useful applications.

COMMUNICATED ARTICLE.

FIGHTING THE FROST.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

For the same reason that Christmas stories, depicting scenes of frost, snow, and winter cold, are written during the sweltering days of July and August, the prudent gas manager finds it advisable, in the slack summer season, to make a quiet forecast of his probable position in December and January next ensuing. A few words on the subject above named will, therefore, not be out of place at this period of the year. During the exceptionally severe weather that prevailed in the early part of 1895, I heard so much about portable boilers, hot water circulating devices, and other efficient but also cumbrous appliances for preventing the freezing of gasholder and purifier lutes, or for thawing those already frozen, that I am led to think that two important points are not so well known or appreciated as they deserve to be. The first is that, with a reasonable boiler capacity, there is already a sufficient power on the works for efficiently dealing with the troubles due to frost; and the second, that a line of steam-pipe laid on to the gasholder and purifier yards, with connections at suitable intervals, to which a 20-feet length of flexible metallic tubing can be coupled up at a few minutes' notice when required, is a valuable acquisition at times when the mercury falls below freezing point.

It is a matter for surprise, in these days when Inaugural Addresses and papers fall thick and fast, that someone has not ere now directed attention to the utility of flexible metallic tubing for many purposes in gas-works. It is applicable for either steam, water, or gas, and is especially valuable as a substitute for india-rubber tubing in the retort-house. It is made either in galvanized steel or copper bronze; and it is sufficiently strong to be perfectly tight, not only with gas or water, but also with steam up to any reasonable limit. For any work in holes and corners—such as retort setting or boiler scraping—the advantages of a flexible tube that will bear any reasonable amount of heat, and stand being trodden upon without injury, are obvious. For stove or meter testing, or for the laboratory, flexible metallic tubing is free from the well-known objections to rubber tubing, and is very serviceable in connection with a portable photometer.

Towards the close of the summer of 1894, the writer had completed a new gasholder with cast-iron tank. The latter is 105 feet in diameter and 25 feet deep, of which nearly 20 feet is above ground level; and the site is very exposed—being without any shelter whatever on the north and east sides. Having decided that ice must be practically prevented from forming in this tank, the next question was how it was to be stopped. Mentioning the matter to various friends as opportunity arose, a suggestion was made to "Go and see Lloyd at Guildford," which was eventually acted upon. I found Mr. Lloyd brimful of good nature and willingness to give the fullest possible information on steam-thawing or any other of the numerous little conveniences which he has arranged on his works. The suggestion proved to have been well founded; and I obtained full particulars respecting the special matter I had on hand, with several other things thrown in, and am entirely indebted to Mr. Lloyd for the means of successfully encountering the frosts of 1895. He showed me some aspirators or injectors, made up of wrought-iron pipe and fittings, in which a jet of steam drew in a

current of water and ejected the same from the nozzle, after the fashion of a jet exhauster; and he pointed out that it was not only the heat derived from the condensation, but also the maintenance of a gentle current round and round the cup or tank, that served to prevent the formation of ice. The injector was placed just below the water surface, parallel with the tank and holder side at that point; and a cork thrown into the current issuing from the nozzle of the injector floated right round the circumference of the holder in a few minutes. This system also has the advantage of completely condensing the steam, utilizing the whole of the heat, and preventing the escape of any visible vapours.

On returning home, some experiments with steam-raisers, home-made injectors, &c., were at once put in hand; and these incidentally had an unexpected but very useful effect. At the time when the long frost commenced, nearly the whole of the tanks and lutes on the works had been warmed up to about 60°, and thus had a very good start. The water in a below-ground tank was found to lose temperature very slowly, and would have stood several days of severe frost before ice was formed. The same effect was observed in a less degree in the cups and purifier-lutes; and this suggested the advisability of a good warm-up all round on the approach of frosty weather. The experiments were directed towards finding the best form of aspirator for inducing a steady current with a ripple on the surface of the water; and the best results in this respect were obtained with an apparatus constructed very much on the principle of a bunsen burner, having a conical nozzle, an enlargement corresponding to the air chamber, and a jet for the steam, in the same position as the gas-nipple. This article is supplied by engineering firms under the title of a steam-tank water-heater, and is used for warming large volumes of water in breweries and other places by means of wet steam. One such aspirator is sufficient for the new tank specially referred to; and a similar one is fixed to the cup, and supplied with steam by a length of flexible metallic tubing. This arrangement is taken away in the spring, and refixed as soon as the cold weather begins. The largest aspirator we have in use has a steam jet ⅝ inch diameter at the nozzle, and is connected to an ordinary 1-inch steam-pipe.

There are several reasons why it is better to prevent the formation of ice in gasholder tanks—and especially in cups and purifier-lutes—if it can be done by convenient and simple means, in addition to the saving of labour in breaking ice. More than once the writer has had to re-sheet the cup of a gasholder; and the old sheets have shown unmistakable signs of injury from attempts to break ice, in the form of deep scratches, bruises, and dents, notwithstanding the strict rule that wooden rammers only should be used. The act of freezing must necessarily set up strains similar to those which are manifested by the bursting of water-pipes; and just at the time when the frost comes, the holders are sure to be in active operation—causing risk of trouble on account of the binding of ice, or the hanging up of partly ice-bound cups. The date when a gasholder gets out of truth could probably be traced to a severe frost; and besides the question must be considered of maintaining a proper supply pressure. All this can be avoided by the simple and inexpensive means above indicated.

For those who are already in a tight place as regards boiler capacity, there is an easy way out of the difficulty—namely, to put down a feed water-heater, by means of which the temperature of the feed-water is raised to 160° or more before entering the boiler, and at the same time a supply of warm condensed water is obtained. This not only means a saving of fuel—itself not an important matter, as the gas-works boiler is (or ought to be) heated by means of screenings from the breeze and coke heaps—but also a corresponding reduction in labour. If hard water is used, a large proportion of the scale is deposited in the heater, and prevented from entering the boiler. There is no risk of reducing the steam pressure a few pounds, which sometimes occurs when cold water is supplied in larger quantity than usual, and is responsible for the curious lines that one would rather not see on the exhauster register and the station meter tell-tale. The waste steam superheater is not so generally used in gas-works as it should be; and the economy secured by its introduction will more than compensate, under ordinary working, for the additional demands due to putting on the steam non-freezing apparatus.

The Discovery of Thorium.—The current number of "Knowledge" contains, among other interesting articles, one by Dr. T. L. Phipson on the metal thorium, which now occupies so important a position in connection with incandescent gas lighting. According to him, it was found in some Norwegian rocks, early in the present century, by Berzelius, the great Swedish chemist, who dedicated it to the mythological deity of the ancient Scandinavians—the god Thor—by naming it Thorium; the mineral in which it was found being called Thorite. Thorium was discovered by a Swedish diplomatist in combination with silica on the island of Loeven, not far from the small town of Brevig, in Norway; subsequently, by the late Professor Woehler, in a stone called Pyrochlore from the Ural Mountains; and more recently, as our readers are aware, in monazite. Thorite and pyrochlore, which contain a large amount of thoria, are still rare and expensive. Monazite, however, is much more plentiful; and as it generally contains about 18 per cent. of horia, it now forms the centre of a new and rising industry.

TECHNICAL RECORD.

INSTITUTION OF CIVIL ENGINEERS.

Annual Report—The New Council.

The Annual General Meeting of the above-named Institution was held last Tuesday, Sir B. Baker, K.C.M.G. (the President), in the chair. The report of the Council for the session 1895-6 dealt first with the changes that had been effected during the session in the charter and the bye-laws. The question of the constitution and the mode of election of the Council has received careful attention from successive Councils since 1888 The outgoing Council were of opinion that the existing circumstances rendered changes in the constitution and the mode of election of the Council desirable in the interests of the Institution. This view having been cordially concurred in by the members generally, the Council recommended that a supplemental charter should be applied for. At a special general meeting held on the 6th of February last, a petition to Her Majesty was duly adopted, and a new supplemental charter was granted on the 20th of March. At a special general meeting held on the 15th of April, the bye-laws were altered to bring them into conformity with the powers thus obtained. Under the new charter, the members of the Institution are at liberty to fix from time to time the number of the Council by bye-laws—thus admitting of the full and proper representation of all engineering interests both at home and in the Colonies and India; while in voting for the election of the Council personal attendance is no longer necessary. The tabular statement of transfers, elections, deaths, and resignations during the year showed an effective increase of 109 on the previous total of 5921; while the number of students was 877, as against 816 at the corresponding period of last year. The gross numbers on the books on the 31st of March in 1895 and 1896 were 6737 and 6907 respectively. During the year, the following amounts were received: Income, £21,778 17s. 3d. (of which £17,847 14s. 6d. represented subscriptions, £1705 19s. 5d. miscellaneous items, and £2225 3s. 4d. dividends); capital, £24,359 2s. (of which £20,690 18s. 6d. was derived from the sale of stocks to meet expenditure on the new building); and trust-funds account, £474 15s. 8d.—making a total of £46,612 14s. 11d. The expenditure amounted to £53,334 0s. 11d. The first meeting of the session was held in the new building on the prescribed day, when the President delivered an address to a very large audience. There were 23 ordinary meetings, at which 19 communications were read and discussed. In recognition of the merits of some of the papers, awards out of the funds appropriated to that purpose were made (among others to Messrs. G. F. Deacon and J. Head.) The papers printed without being discussed treated, as usual, of a variety of subjects; and, in recognition of the labours of some of the authors, premiums were awarded to Messrs. Bryan Donkin and Alan Brebner for papers published in Vol. CXXII. The fourth annual lecture of the "James Forrest" series—"Physical Experiment in Relation to Engineering"—was delivered by Dr. A. B. W. Kennedy, F.R.S., M.Inst.C.E., on the 7th ult. This discourse, which was noticed in the "JOURNAL" for the 12th ult., will be printed in the concluding volume of the Proceedings of the session. The attendance at the supplemental students' meetings showed some improvement—the average having been 48. The report having been adopted, cordial votes of thanks were passed to the President, the Vice-Presidents, and other members of Council; and to the Auditors and the Scrutineers.

The ballot for Council resulted in the election of Mr. J. Wolfe Barry, C.B., F.R.S., as President; of Mr. W. H. Preece, C.B., F.R.S., Sir Douglas Fox, Mr. J. Mansergh, and Dr. W. Anderson, C.B, F.R.S., as Vice-Presidents; of Mr. A. R. Binnie, Mr. H. Deane, Mr. W. R. Galbraith, Mr. G. Graham, Mr. J. H. Greathead, Mr. J. C. Hawkshaw, M.A., Mr. C. Hawksley, Dr. J. Hopkinson, jun., M.A, Wh.Sc., F.R.S, Dr. A. B. W. Kennedy, F.R.S, Mr. J. Kennedy, Mr. G. F. Lyster, Sir G. L. Molesworth, K.C.I.E., Captain Sir A. Noble, K.C.B., F.R.S., late R.A., Mr. W. Shelford, Mr. B. B. Stoney, F.R.S., Mr. F. W. Webb, Sir W. H. White, K.C.B., F.R.S., and Sir E. L. Williams, as other members.

A Water-Meter Competition.—The Milan Corporation, prior to entering into new contracts for water-meters, are arranging for a competition, with the view of ascertaining the best appliance suited to their requirements.

The Value of Water Inspectors.—The importance of a good inspection system where meters are not in general use in the water service is illustrated in the annual report of the Water Commissioners of Norfolk (Va.). In that town, two inspectors not only discovered and stopped waste amounting to 1½ million gallons daily, or about one-fourth the entire quantity pumped, but also discovered sources of revenue not before known to the Board amounting to within $100 of the salary of the two inspectors. Among these unknown consumers were 1113 rooms, worth $556 annually; 68 closets, worth $146; a barber's shop, worth $6; and a bar-room, worth $15. Meters are used only on the large services in Norfolk, as a heavy vegetable deposit in the water clogs the small meters too soon to allow them to be depended upon.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Estimation of Nitrogen in Coal Gas.

SIR,—The opinion expressed by Mr. Pryce, in his letter which appeared last week, that "it is doubtful whether in coal gas any but traces of nitrogen has its origin from the coal itself," is one that I understood to be advanced in Mr. Hunt's paper which I had the pleasure of listening to on the occasion of its reading. If such opinion represents the facts of the case, then the nitrogen found in coal gas must have been derived from the atmosphere. It was to oppose this somewhat uncomfortable conclusion that I was tempted to make the remarks that have occasioned Mr. Pryce's letter. The unreserved acceptance of the opinion in question, taken in conjunction with various published analyses, places, I believe, the gas industry of this country in an equivocal position.

Professor Foster published analyses of town gas supplies with such percentages of nitrogen as 13·89, 10·5, and 9·71. In 1851, Dr. E. Frankland found from 0·38 to 5·01 in various samples of London gas. Humpidge, in 1876, found from 2·71 to 9·73 per cent. Dr. Percy Frankland, in 1882 to 1884, found in various town supplies throughout the country from 2·07 to 10·84 per cent. If these analyses be representative, and Mr. Pryce's opinion be correct, then the only conclusion that can be drawn is that since 1851 London gas is more diluted with air than at that period; and also that town supplies throughout the country are largely so diluted, and in one case to an amount represented by the addition of what was originally about 17·5 per cent. of air.

Is this conclusion to be accepted without comment? To dilute coal gas with air is economically absurd. It is not thereby rendered intrinsically more valuable, and there are weighty grounds for believing that such dilution, and to such an extent as would be indicated by the quoted analyses, would be distinctly prejudicial to its office as an illuminating agent. Why should such quantities of air be added to the gas and sold perhaps at 3s. per 1000 cubic feet to gas consumers? I pointed out at the meeting that the analyses, taken in conjunction with the text of the paper, would prove that the London and Birmingham gas had suffered from the addition of 5 or 5·5 per cent. of air; and the bulk, after purification, increased by an amount of about 450 cubic feet per ton; but I did not think it was intended to convey such an impression. If we accept Mr. Pryce's views, we must modify those we hold respecting the amount of gas yielded by coal in practice. In the case of the town supply examined by Professor Foster, and found to contain 13·39 per cent. of nitrogen (and to this must be added the 0·57 per cent. of oxygen, which is certainly not a coal distillation product), some 14·46 per cent. of its bulk is of atmospheric origin. If the undertaking supplying that gas had been making 10,000 cubic feet per ton, then only 8554 cubic feet came from the coal, and 1446 cubic feet from the air. What would the administration of such an undertaking say if it were asserted that they were not making 10,000 cubic feet from the coal, but only some 8500 cubic feet, and that the rest was *air?*

There is nothing *primâ facie* impossible about an analysis that shows a large proportion of nitrogen, since, if air has been added, its quota of nitrogen will be found on careful analysis. I have never regarded such analyses as impossible, but as startling; and before giving credence to such figures, I should certainly require some collateral evidence in their favour, or I should have to adopt the view that the manufacture of coal gas is not what it is supposed to be.

As regards analyses showing no nitrogen at all. It is not mere suspicion that guides me in this case. I have always found small quantities of free nitrogen in coal gas made under circumstances specially designed to avoid its contamination with atmospheric nitrogen;* and the amounts so found (of the presence of nitrogen in such case there has been both qualitative and quantitative proof) fit in very well with what has been obtained from the other distillation products—viz., coke, tar, liquor, impurities—in making up the total of what was originally in the coal.

The adoption of Mr. Pryce's view will not only make the question of air dilution much graver, but will make it necessary for someone to go over the work of various investigators who have studied the distribution of the nitrogen of the coal among the distillation products. Professor Foster, working on the laboratory scale, accounted for all but from 21·2 to 35·7 per cent. of the nitrogen in coals by direct determinations of the nitrogen in the ammonia, cyanogen, and coke; and he stated his belief to be that the greater part of the nitrogen unaccounted for was in the gas in the free state. I have had the opportunity of studying the distribution of nitrogen in working practice (*vide* "Dictionary of Applied Chemistry," art. "Coal Gas"), and have found that the free nitrogen in coal gas filled up the gap between that found in the tar, liquor, purifiers, and coke, and that originally in the coal. So that on all sides the acceptance of Mr. Pryce's conclusions is uncomfortable, especially as it will make mysterious the whereabouts of some 40 per cent. of the nitrogen originally in the coal.

Mr. Pryce has carefully studied these matters, and has evidently not trusted to a single analysis, but has confirmed his results by the use of various methods; and he almost tempts me to doubt the views that I have held after a long study of the question from practical and theoretical standpoints. But before doing so, I should like to learn from him how the nitrogen in the coal is to be disposed of, and how it is practicable to dilute coal gas with air to the extent indicated by the quoted analyses.

LEWIS T. WRIGHT.

1, *Victoria Street, S.W., June 6, 1896.*

* See "On the Estimation of Free Nitrogen in Coal Gas," "JOURNAL," Vol. XLIV., p. 105.

The Accident to the Gasholder at Gothenburg.

SIR,—I am very glad to observe that, after all, Mr. Cripps drew out a letter from Mr. Samzelius; and your exerting yourself to have in the same number Mr. Cripps's criticism deserves our special thanks. Perhaps you will kindly allow me a final trespass on the subject.

First with regard to Mr. Cripps. I found fault with him, and pointed out that he confused causes and their conditions. Since then I have been revising my former studies, and I find that Jevons, in his "Principles of Science," states that "when we attribute to the *laws* of causation any meaning beyond that of the *conditions* under which an event may be expected to happen, we abandon both etymology and philosophy." In this quotation, the term "conditions" is equivalent to laws, and thus favours my view. But he also says: "Concerning every event, we shall have to determine its probable conditions, or the group of antecedents from which it probably follows. An antecedent is anything which exists prior to an event." Here "probable conditions" and "group of antecedents" are convertible. I may quote one more authority. Professor Veitch, in his "Logic," states that, "as a rule, the cause of a phenomenon is itself a sum of phenomena or antecedents. The cause, in fact, is made up of non-causes or conditions, all acting together and producing a definite effect." Here causes and conditions are equipollent. I therefore withdraw my statement that Mr. Cripps confuses causes and conditions. In fact, the subject is so pregnant and conterminous to two schools of philosophy, that there is sufficient material for a debate of several nights' duration in a University Students' Debating Society. I shake hands with Mr. Cripps, and express my esteem for him.

Now as to Mr. Samzelius. He states "that he had many troubles with English bottom rollers in former holders; that a brother manager found several rollers broken, and all the others fixed by rust; that he was not unaware that remarks could be made against shallowness and the want of bottom rollers in the holder; that he regretted not having read Mr. Cripps's work on 'The Guide-Framing of Gasholders;' that a gasholder constructor told him to adjust the rollers when the holder is empty," &c. Mr. Samzelius's mental attitude was not altogether scientific. He listened to everybody's advice, and thereby committed the fallacy of "illicit process of the minor;" and had he energized himself, he would have found, by the differential method of induction, that the story of the bottom rollers illustrated the "fallacy of accident," and that "it was contrary to all English experience with properly designed and constructed holders."

I have pointed out to him the *vera causa* of the destruction of his holder; and I would strongly advise him to apply to an English expert, who would not only design, but also supervise, the construction of the holder, and give guarantee, by carrying out his instructions, against wind and snow, security from trouble, and safety from harm. The expert I would recommend is Mr. F. S. Cripps. He has been highly spoken of by Mr. George Livesey, the pioneer of large gasholder construction, a man of fertile resource and inventive genius, and whose name is a word to conjure with. Mr. Livesey, by the graphic method, investigated the strains and stresses of his large holder, which was confirmed by the mathematical method of Mr. Cripps.* Mr. Cripps is known to be thoroughly at home in the construction and working of gasholders. I hope he will not keep all his experience to himself, but will accede to my wish, which I am sure is the wish of all, expressed in a former letter.

D. COATS NIVEN.

Calcutta, May 13, 1896.

[This correspondence is now closed.—ED. J. G. L.]

* "Notes on Building Construction." Part IV.—Calculations. Lineham: "Text-Book of Mechanical Engineering." The two best books for beginners on "Graphics." D. C. N.

New Joint-Stock Companies.—The Anti-Vibration Incandescent Lighting Company, Limited, has been registered with a capital of £5400, in £10 shares, to acquire the undertaking of the Incandescent Gas Lighting Improvement Company, now carried on at Bradford, and to carry on and extend the same. The Manchester Gas Cooker, Limited, is the title of a Company which has been registered with a capital of £5000, in £5 shares, to enter into an agreement for the acquisition of the undertaking of the Manchester Engineering Company, now carried on at the Knowsley Works, Cheetham, Manchester, and to carry on the business of iron and metal founders in all its branches.

The Salary of the Rotherham Gas Manager.—At the monthly meeting of the Rotherham Town Council last Wednesday, the Gas Committee recommended that the salary of Mr. M. Murdoch, the Gas Manager, should be increased £25 a year for each of the next four years. Mr. Copley suggested that the minutes should be referred back, as he considered Mr. Murdoch was worth more money; and he moved that the amount be £50, instead of £25. Mr. Hall seconded the motion, which was supported by several members of the Council. Mr. Gummer, the Chairman of the Committee, said that the amendment had his sympathy, and that a £50 increase was suggested in Committee. It was, however, thought the increase should be gradual.

The Tiverton Corporation Gas Undertaking.—A report on the first year's management of the Tiverton Gas-Works since they passed into the hands of the Corporation was presented at a meeting of the Town Council of that borough last Wednesday. The balance-sheet showed that the expenditure and liabilities amounted to £5118, and the receipts and assets to £6953. There was thus a balance of profit on the year's trading of £1835, from which had to be deducted £800 for interest on capital; leaving a net balance of £1035. As they had been working during part of the year with an overdraft at the bank, the Lighting Committee did not propose to appropriate this balance, especially as the annual payment for interest and instalment of loan will shortly be £1350 instead of £800. Mr. J. Thorne, the Chairman of the Lighting Committee, said the Committee considered the result of the first year's working very satisfactory. Some discussion took place as to the keeping of the accounts of the Gas Department. This is at present done in the Accountant's department, and a sum of £30 per annum is paid to the Accountant for the additional work. Some members of the Council thought the work should be done by the Gas Manager (Mr. W. Littlewood). The Mayor (Mr. Amory), however, pointed out that before the Manager was appointed the Town Council distinctly affirmed that the gas accounts should be kept at the office of the Accountant. He should not allow this decision to be upset except by a definite resolution moved after due notice.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Bill presented, read the first time, and referred to the Examiners: Kelly Water Provisional Order Bill.

Bill reported with amendments: Gas Provisional Orders Bill [Orders confirmed].

Bills read the third time and passed: Chelsea Water Bill, Lambeth Water Bill.

Bill withdrawn: Porthcawl Water Bill.

A petition was presented against the East Surrey Water Bill, from the Caterham Parish Council.

The petition of the Southwark and Vauxhall Water Company against the Staines Reservoirs Bill was withdrawn.

HOUSE OF LORDS COMMITTEE.

Wednesday, May 13.

(*Before Lord* KENSINGTON, *Chairman; Viscount* POWERSCOURT, *Lord* ADDINGTON, *Lord* CALTHORPE, *and Lord* SALTOUN.)

DUBLIN CORPORATION BILL.

This Bill, which, among other things, is to confer upon the Corporation of Dublin certain powers in respect of the gas supply of the city, and to make further provision with regard to the supply of water to the adjoining townships, came under consideration by the above-named Committee to-day.

Mr. PEMBER, Q.C., Mr. BALFOUR BROWNE, Q.C., Mr. MACINERNEY, Q.C., Mr. G. FITZGERALD, and Mr. J. O'CONNOR appeared for the promoters. The various opponents of the Bill were represented as follows: The Alliance and Dublin Consumers' Gas Company, by Mr. LITTLER, Q.C., Mr. PEMBROKE STEPHENS, Q.C., Mr. J. D. FITZGERALD, Q.C., and Mr. GORDON; the Clontarf Commissioners, by Mr. LITTLER, Q.C., and Mr. WHITEHEAD; the Kingstown Commissioners, by Mr. LITTLER, Q.C., Mr. J. D. FITZGERALD, Q.C., and Mr. MUNROE; the Pembroke Commissioners, by Mr. PEMBROKE STEPHENS, Q.C., Mr. J. D. FITZGERALD, Q.C., and Mr. P. N. FAWCETT; the Blackrock Commissioners, by Mr. T. LEE ROBERTS; the Bray and Clontarf Commissioners, by Mr. LITTLER, Q.C., and Mr. MUNROE; the Dalkey Commissioners, by Mr. SQUIRE; and Messrs. A. Guinness and Co., Limited, by Mr. LITTLER, Q.C., and Mr. GRIEG.

Mr. PEMBER, in opening the case, said the objects of the Bill were threefold. In the first place, it was intended to settle a matter connected with the water supply of Dublin and the neighbourhood; in the second, it aimed at clearing up some difficulties and getting rid of certain anomalies which had arisen in connection with the gas supply of Dublin; and, in the third, it included miscellaneous enactments which, except in one matter, were not opposed. He would take the water and gas cases separately. The water supply of Dublin and the neighbourhood was dealt with under the provisions of the Corporation Act of 1861, which provided for the taking of water from the River Vartry. Subsequently the Commissioners of Kingstown, Blackrock, and other townships obtained Acts of their own, under which the Corporation had to supply the townships with water in bulk equal to 20 gallons per head of the population in each. There was no obligation on the Corporation to furnish a supply to the townships except on requisition; but the townships could not go elsewhere for their water. In 1874, the Corporation obtained a Provisional Order by which they were empowered to furnish the various townships with an excess supply of water at a rate not exceeding 4d. per 1000 gallons; but it was provided that they were only to do this on notice being received from the township that they wanted such a supply. In 1885, the Corporation went to Parliament for an Act to enable them and the townships to agree on some method for ascertaining the extent of the population, with the view of determining what the townships must pay for excess water. The Corporation had supplied the townships with water at rates varying from 3⅛d. to 5d. in the pound as far as the 20 gallons per head were concerned. These rates were much lower than those paid by the population of Dublin. Between 1862 and 1865, the citizens paid in domestic water-rates 1s. 3d. in the pound; between 1866 and 1889, 1s. 0½d.; and since then they had paid from 6½d. to 6d. In no case, however, had the price paid by the citizens fallen to the level of that paid by the inhabitants of the townships. As a matter of fact, the townships received for many years a great deal more than 20 gallons per head. It had been found impossible to prevent this, as the supply was constant and under pressure by statute. According to the Provisional Order of 1874, the Corporation could not charge for an excess supply unless the townships applied for one. Some of them had asked for such supplies, but had afterwards withdrawn their demands; and the result was that they now had excess supplies for nothing. There had been much litigation between the Corporation and the townships with reference to the excess water. The Corporation only wanted to do what was right and fair. But they objected to supplying the townships with water for nothing; and they therefore asked Parliament to strengthen their hands in this matter. The Bill provided that if in any of the townships an excess supply should be used, the township should, notwithstanding the non-service of a notice on the Corporation under the Provisional Order of 1874, pay for all water used beyond the statutory supply at the rate of 3½d. per 1000 gallons. Petitions against this part of the Bill had been presented by the townships of Kingstown, Blackrock, Bray, Clontarf, and Dalkey. The gas clauses were petitioned against by the Alliance and Dublin Consumers' Gas Company. One of their provisions was that the Corporation might provide and maintain four places for testing the illuminating power, purity, and pressure of gas supplied by the Company. At present there was only one testing-place. Provisions were inserted in the Bill with regard to the kind of photometers to be used, it being contended that the instrument now employed at the Company's testing-place was defective in various ways. The Bill also provided that the standard price of gas should be reduced. At present, it was 4s. 1d. per 1000 cubic feet; and the amount actually charged was 3s. 5d. There were various provisions with regard to the supply of gas; and the promoters thought the Company ought to be put under the conditions laid down in the Bill, if the supply was to remain in their hands instead of passing into those of the Corporation.

Thursday, May 14.

On the re-assembling of the Committee this morning, witnesses were called in support of the Bill.

Mr. *Spencer Harty*, the City Engineer and Surveyor of Dublin, stated, in answer to Mr. G. FITZGERALD, that the Vartry scheme for supplying Dublin with water was carried out by the advice of Sir John Hawkshaw on the footing of providing the outlying townships as well as the city itself with water. The total cost had up to the present been £698,000, all of which was provided by the Corporation; but the construction of a second reservoir was now in contemplation. The Corporation were obliged, under their Provisional Order of 1874, and the Township Acts, to supply to the townships 20 gallons per head per day on their population.

Mr. LITTLER, Q.C., remarked that the construction of the statute was in dispute.

Witness went on to say that the townships were entitled, on giving notice to the Corporation, to an excess supply, if the Corporation had it to give. Since 1874, difficulties had arisen in the working of the legislation ruling the supply of water to the townships, as it had been found impossible to prove what the population was from day to day. The water supplied to the townships was delivered by meter on the township boundaries. As far as Kingstown was concerned, there was a statutory obligation to furnish a constant supply. If the Corporation reduced the pressure in the case of any township, people living in the higher parts of the district might get no water at all, while those in the lower portions would have plenty to waste. Under these circumstances, the Corporation had practically no remedy against having excess water taken without being paid for it. An action brought by the Kingstown Commissioners in 1881 against the Corporation on the subject was dismissed by the Court of Appeal; and Lord Justice Fitzgibbon then held that the Commissioners had no right to get more than the fixed quantity per head mentioned in the Acts without paying for it. As a matter of fact, however, under existing circumstances, they could do this. The townships of Bray and Blackrock for a time paid for their excess water; but they had now ceased to do so. Pembroke, Killiney, and Kilmainham paid for excess at the present time—Pembroke having most loyally done so from the beginning. The Corporation were willing to give an excess supply at the rate of 3½d. per 1000 gallons. He regarded this as emphatically a fair price. He was not aware of any instance in the United Kingdom in which a corporation supplied water to an outside district at as low a charge as 3½d. The ordinary consumers of water in Dublin had to pay 6d.; and large consumers paid a minimun of 4d. The proposed new storage reservoir and works would cost the Corporation about £200,000, of which part had already been spent. Some of the petitioners complained that they had not obtained from the Corporation as much water as they wanted; but, as a matter of fact, they had had too much, except during the great drought of 1893, when for a time Dublin, in common with the rest of the United Kingdom, had to reduce their supply.

In cross-examination by Mr. LITTLER (for Kingstown), witness said he was not aware that the Corporation had long ago received sufficient money from Kingstown to wipe out a capital sum of £12,000, which Dublin had spent in providing the township with a water supply. The Kingstown Commissioners, in a petition they once lodged against a Bill of the Corporation, said that, with regard to the £6000 spent in acquiring the Kingstown water rights, it would not be wiped out until 1909.

In cross-examination by Mr. PEMBROKE STEPHENS (for Pembroke), witness stated that in October, 1893, notice was given that the Vartry water would be shut off from a portion of the city, and filtered canal water substituted for it. That notice only remained in force for about two months, and was due to the drought which extended all over the United Kingdom. Such a drought had not been known for a hundred years. If Pembroke had had a supply of its own, it would have been no better off.

The CHAIRMAN: We all recognize that there was an exceptional state of things in 1893. I was driven from my own house through it.

Mr. PEMBROKE STEPHENS said the question was what had been done since to prevent a repitition of the state of things that existed in 1893.

Witness said the Corporation were in a much better position now to deal with a drought than they were in 1893, because the consumption had been reduced from 14½ to a little over 11 million gallons per day.

Cross-examined by Mr. LEE ROBERTS (for Blackrock), witness said the cost to the Corporation of furnishing a supply of water to Blackrock had been comparatively nothing, as their mains ran along the Blackrock boundary. It was a fact that in 1894 the Corporation offered the townships 25 gallons a head with an increased supply in the summer. This offer was made because the Corporation were anxious to come to terms with the townships; but it was not accepted. Witness was of opinion that the water undertaking ought to be worked at a profit. Since 1881, the Blackrock Commissioners had not paid a single penny for excess water; and no action had been taken against them by the Corporation to recover the price of such water.

Cross-examined by Mr. MUNROE (for Bray), witness admitted that Bray paid 4d. per 1000 gallons for water, while two of the townships paid only 3½d.; but the Corporation had expended the sum of £1944 in laying a pipe from their main to Bray. He could not say whether it was or was not the policy of Parliament to allow one sanitary authority to make a profit out of another; but he thought the authority which bore all the risk of maintenance ought to be allowed to make a profit. By the proposed expenditure of £200,000 on new works, Bray would have the benefit of never being short of water in the future.

Cross-examined by Mr. SQUIRE (for Dalkey), witness said he was aware that Dalkey had expressed its willingness in 1894 to join with

other townships in a scheme for providing themselves with an independent supply of water, and severing their connection with the Water Committee of the Dublin Corporation. In his opinion, a supply of 30 gallons per head per day was not needed in Dalkey, though the township contained many large houses and gardens.

In re-examination, witness said he believed Manchester, Glasgow, and all the large municipalities in Great Britain, charged more for water furnished to outside districts than they did for that supplied to their own people. He was not acquainted with any case except that of Dublin in which a corporation supplied water to outlying districts and received nothing for it. If the out-townships had paid for the excess water actually delivered to them, the Corporation would have been about £37,000 better off.

Mr. *Eyre*, the Treasurer of the City of Dublin, said he had prepared tables showing the quantity of excess water consumed by the various townships between 1886 and 1895, the quantity consumed and not paid for by the townships during that period, and the amount the Corporation had lost by non-payment for water supplied. These he put in. Another table he had prepared showed that the average rate paid by the citizens of Dublin for water between 1866 and 1894 had varied from 1s. 3d. to 6d. per 1000 gallons, while that paid by the inhabitants of the townships had varied from 3½d. to 5d. Dalkey should have paid, but had not done so, £4216 for excess water; and Kingstown, £11,201. The Blackrock Commissioners really owed the Corporation £5220 for excess water. The Corporation had never been able to recover that money.

Mr. *J. Watson*, M.Inst.C.E., examined by Mr. J. O'Connor, said he was Water Engineer to the Bradford Corporation, and formerly occupied a similar position under the Dundee Water Commissioners. Bradford supplied 29 out-townships with water, and was spending £1,300,000 on new works. The out-townships received the water in bulk at their boundaries, and maintained their own distribution system. He was acquainted with all the important water-works in Scotland, and with many in England; and he also knew the Dublin Water-Works. He was of opinion that the water provisions of the Bill were fair and reasonable. He thought the 20 gallons per head per day for a purely domestic supply was a fair quantity. He had made a list of 60 towns whose water supply for all purposes ranged from 12 to 28 gallons per head per day. He found that the supply in Aberdare was 14 gallons; in Deal, 14; in Bath, 17; in Leamington, 17; in Gosport, 18½; in Canterbury, 19; in Chatham, 19⅝; in Bolton, 20; in Doncaster, 20; in Ramsgate, 20; in Ryde, 20; in St. Albans, 20; in Nottingham, 20½; in Scarborough, 20½; and in Dover, 21. The price proposed in the Bill for excess water—3½d. per 1000 gallons—was, in his opinion, a very low one. He had no experience of such a price in England or Scotland. The nearest approach to it he knew of was the charge of 4d. made at Falkirk for an out-township. The Bradford Corporation supplied 53 million gallons to neighbouring towns at a uniform rate of 9d. per 1000 gallons. The quantity supplied in Bradford worked out at 18½ gallons per head per day for domestic purposes. Townships surrounding a large capital could undoubtedly get their water more cheaply by taking it from the central corporation than by obtaining an independent supply. The opponents of the Bill seemed, in effect, to demand an unlimited supply. Where there was divided authority and responsibility, it would, in his opinion, be highly dangerous to give such a supply. He thought the most satisfactory method of dealing with the points in dispute under the Bill would be for the townships to take the water in bulk, as the meter would then become the impartial arbiter between the supplier and the consumer. Any other system would, in his opinion, only lead to difficulty and trouble.

In cross-examination by Mr. Munroe, witness said he was not aware that Plymouth supplied the outlying district of Stonehouse with water at the rate of 2½d. per 1000 gallons. If so, the circumstances must be very exceptional, because the inhabitants of Plymouth proper were charged much more than that.

By Mr. Lee Roberts: At Eastbourne, the consumption of water was 28 gallons per head; and at Newcastle-on-Tyne, it was for all purposes about 40 gallons per head. He did not know that in Plymouth the consumption was 42 gallons; but in Glasgow last year it was 51 gallons. If a supplying authority had to pay only 1½d. per 1000 gallons for their water, he did not think it would be reasonable to charge 3½d. to the outlying districts. An addition of 25 per cent. to the cost to the supplying authority would represent a fair profit.

Friday, May 15.

On the resumption of the proceedings this morning,

Mr. *L. L. Macassey*, M.Inst.C.E., said he had been consulted from time to time by the Dublin Corporation in regard to questions of water supply, and he was acquainted with their contracts. He regarded that with Pembroke as one for the supply of 20 gallons per head per day with a continuous supply. He was engaged in the action of Kingstown against the Dublin Corporation, in which the difficulty was that the valves of the Corporation could not limit the supply to the contract quantity. This could not be done without friendly co-operation between the authorities on both sides of the valves. A consumption of more than 20 gallons per head was unnecessary for Kingstown. In one case it had reached 50 gallons per head; and the Corporation could not check the waste without the friendly co-operation to which he had referred. In Bray the waste had at one time brought the consumption to three times the statutory limit—viz., 60 gallons. In Blackrock there was a very real and substantial waste, though it was not so great as in the other cases. In Dalkey the waste had increased the consumption to 50 gallons. In Clontarf the waste of water was represented by a difference between the 20 gallons required and 50 gallons used. He could name a number of large towns in which the consumption of water was not more than 20 gallons per head; and his experience was that this was quite enough. If the Bill passed, it would check the waste of water, as people did not waste what they had to pay for. He thought 3½d. per 1000 gallons a fair price. In other places, 4d. per 1000 was paid by outside authorities supplied by a corporation. Clause 9 of the Bill provided for a supply by meter; and he knew of no other way of estimating the quantity. If the townships liked, they could put a check meter on the other side of the Dublin meter. The water supply was both cheap and good; and he thought nothing could be fairer than that the townships should be asked to pay a proper price for it. There was no justification whatever for their refusing to do so.

Witness was cross-examined by Counsel representing the Commissioners of the several townships concerned.

Alderman *J. Meade*, examined by Mr. G. Fitzgerald, said he was Chairman of the Water Committee of the Dublin Corporation n 1894, and had taken great interest in the water question for years. There had been a good deal of friction and feeling on the matter. From his point of view, the ratepayers of Dublin were suffering an injustice; and he regarded the proposals of this Bill as a fair and equitable settlement of the question at issue. Up to 1893, the Corporation thought their supply was practically unlimited. But the drought of that year revealed the unchecked waste that was going on; and steps had to be taken to stop it. They had, of course, to look to the future and the possible recurrence of a similar season, and schemes were proposed for increasing their supply. A Provisional Order for this purpose was obtained in 1895, by which they were enabled to acquire the necessary land. In the meantime, Kingstown applied for a Provisional Order of their own, on the ground that the Corporation had broken their contracts. The Local Government Board thought the Bill was to some extent unfair; but they warned the Corporation that they must take care to be in a position to give Kingstown an adequate supply in future. The Corporation had not yet acquired the land under the Act of 1895; but since 1893 the consumption of water had been so much reduced that they thought there was no immediate necessity for the new works. When the townships had to pay for every 20 gallons of water, they would take steps to check the waste. The Pembroke consumption had been reduced from 36 gallons to 25 gallons since 1892; and their figure had always been a lower one than the non-paying townships.

In cross-examination, witness stated that the Corporation were contending in the Bill that contracts entered into between two parties, and carried out by one of them, should be carried out by the other. He believed the Kingstown people were divided as to getting their water supply from Lough Bray, though a resolution to this effect had been passed by a majority of the Commissioners. Messrs. Arthur Guinness and Co. paid upwards of £2000 a year for water supplied by meter; and this was a proof that the meter system was considered satisfactory. The Corporation were perfectly willing to replace their meters whenever they were shown to be wrong to any extent. Witness detailed the particulars of the negotiations between the Corporation and the Rathmines Town Council for a water supply.

Monday, May 18.

Mr. Pembroke Stephens this morning opened the case for Pembroke, and urged that the Dublin Corporation had no fault whatever to find with them. It was not denied that what Pembroke had paid for their water was something like £60,000; but taking the proportionate population of Pembroke and Dublin, if the township had borne their share of the cost of providing the whole supply that share would only have been about £30,000, or one-half of what they had already paid for their supply alone. Surely it was time for them to do something, when the case stood like that. They were advised by a skilled engineer that they could provide themselves with a supply at a cost of 1½d. per 1000 gallons; and this brought to their minds rather strongly the contrast between that cost and what they had been paying to Dublin. The question, however, was an immediate one, and other inquiries were made. It was then found that Rathmines would supply them with a million gallons for ⅝d. per 1000 gallons; and the quantity was sufficient at the time. They had thus been tied to a supply for which they paid 2⅛d. per 1000 gallons, as against 1½d. by one of the proposed schemes, and ⅝d. by the other. They saw no reason why they should cut themselves adrift from the Dublin supply; but it was necessary that they should be put in a position to apply pressure upon the Corporation by being empowered to say to them that, after fair notice, they would get their own water.

Mr. *Dixon* stated that he had constructed the reservoir at Rathmines, which was completed eight years ago. The supply for the township was about 2,100,000 gallons, and for millowners about the same quantity. The works were made to supply something like 5,000,000 gallons.

Mr. *R. Hassard*, M.Inst.C.E., stated that he had designed the original Vartry works, and also the water-works for Rathmines. The total cost of the water as supplied at the Pembroke township boundaries was about 2½d. per 1000 gallons, or including the cost of distribution about 4½d. In Dublin, where a rate of 4d. was levied in the city for water used for domestic purposes, the cost to the consumer, on the basis of a consumption of 36 gallons per head, was ⅝d. per 1000 gallons. Therefore the cost in Pembroke was six times as much as it was in Dublin; and if the rate were reduced to 3d., the Pembroke consumer would have to pay eight times as much as his Dublin neighbour.

Cross-examined: He thought the Dublin people would be able to consume all the water the Vartry would supply; and he considered that the townships should be allowed to have water on the same terms as the consumers in Dublin, or that they should be permitted to get it from an independent source.

Mr. Lee Roberts followed for the Blackrock Commissioners. He said the relations between the Dublin Corporation and the Commissioners had for years been based on the assumption that there was to be no limit of the supply of water to 20 gallons per head; and it was not until a special agreement with Drumcondra was made to contain that provision that it entered the heads of the Corporation to apply it to Blackrock. The Corporation had perpetually harassed and distressed the Commissioners; and in 1874, on one Saturday in August, they received notice that, unless they agreed by the following Monday to pay for excess water, the supply would cease. It was only in these circumstances that they would offer 1½d. per 1000 gallons; and if this were not satisfactory, they would be prepared, with Kingstown and Dalkey, to hand over £65,000 to the Corporation, conditional upon their getting a full supply of water. They thought they were entitled to a supply as nearly as possible on the same terms as the citizens of Dublin had it.

Mr. *J. R. Wigham*, the Chairman of the Blackrock Commissioners and of the Dublin Chamber of Commerce, supported the learned Counsel's statement. He said he believed the proper way to settle this question was to act on Alderman Meade's suggestion, and charge a certain rate per 1000 gallons, by meter. As they had offered 1½d. per 1000 gallons, he did not believe there would be much difficulty in agreeing upon the price.

Lord POWERSCOURT: Why do you not settle that with the Corporation? You might do it by to-morrow morning.

Witness: This is what I should like very much: The offer of 1½d. per 1000 gallons to cover all the water supplied up to 35 gallons per head, and an additional sum to be paid for any excess quantity.

Tuesday, May 19.

On the assembling of the Committee this morning, it was announced that Lord Calthorpe had met with an accident, and therefore would be unable to attend any further sittings. After a consultation between Counsel, it was agreed that the water portion of the Bill should be proceeded with by the four members present.

Mr. PEMBER, referring to a conversation which occurred on the previous day, said he was distinctly willing to announce that, if the townships were to approach the Corporation with a view to get the basis of supply in the Act of 1863, and others of various dates, altered to one of a certain rate per 1000 gallons, the Corporation would consider it favourably, and endeavour to come to a reasonable conclusion.

Mr. LITTLER said he had that morning had considerable discussion with Lord Ardilaun, who was interested as a resident in Clontarf; and his Lordship was most anxious to come to a settlement, but entirely without prejudice to anything which might occur before their Lordships.

The CHAIRMAN: The thing that weighs most in my mind is the very great amount of money that is being expended in prolonging this inquiry; and if the parties were to go to Dublin to consult and then come back here again, instead of a saving there would be increased expenditure. There should be a consultation here between the parties; and I cannot help throwing out a very earnest hope that some arrangement may be come to. We have heard from Mr. Alderman Meade and Mr. Wigham—one gentleman a witness for the promoters and the other for one of the townships—that, with some differences, they are both prepared to accept the principle of meterage; and as the whole difference is between, I think, 1½d. and 2½d. per 1000 gallons, this is a very small amount of variation.

Evidence was then proceeded with.

Mr. *Heron* and Mr. *T. Pim* expressed opinions in favour of the meterage basis.

Mr. *Hassard* was re-called, and stated that he estimated it would be possible to deliver as much as 35,000 gallons per day at the boundaries of the townships at a cost of 1·57d. per 1000 gallons, as against 2½d. charged by the Dublin Corporation.

Mr. MUNROE (for Bray) said that when the Bray Township Act was passed, it was intended to have a separate water supply; and it was easy to obtain one. But the Corporation of Dublin approached the promoters of the Bill, and the result was that they agreed to take water from them—the unquestioned bargain being that the minimum quantity was to be 20 gallons per head. It was most unfair now, after the Corporation had induced them to be customers, that Bray should be asked to pay the Bill for the proposed increase.

Mr. *Breslin*, the Chairman of the Bray Commissioners, said he was one of the promoters of the Bray Township Act, the object of which was to provide works to furnish an independent and ample supply of water to Bray. It was ascertained that they could get a good supply of their own. As a result of a conference with Sir John Gray, it was arranged that Bray should be connected with the Vartry works. They had obtained an ample supply for a time, and had not asked for excess water; and it was never suggested that the Corporation should receive payment for such water.

By the CHAIRMAN: Their position was that they were willing to obtain their supply from the Corporation, provided they could get such a quantity of water beyond the 20 gallons per head as they might require without paying for it; and if they could not get that, they would find their own supply.

Mr. *M. Langton*, a former Chairman of the Bray Commissioners, said he would be quite prepared to assent to a meterage rate, provided the cost of water to Bray was not increased.

Mr. *P. Comber*, the Engineer of the Bray Commissioners, said he had satisfied himself that an independent water supply for Bray was feasible, at a cost of £9000, which would give 54 gallons per day per head of the population. This would amount to about 5d. in the pound on the rates.

Mr. *P. M'Donnell*, the Town Clerk of Bray, stated that, owing to the increase in the valuation, they were paying 50 per cent. more now for their water than they were in 1865. If the Commissioners had obtained an independent supply 30 years ago, they would not only have paid for it with the money they had paid the Corporation since, but would be £1000 better off than they were. If the Bill passed, the rates on the township would be increased by 8d. or 9d. in the pound; and the gross charges would become 1s. 3d. or 1s. 4d., which would be higher than was paid in Dublin in the old days, and would be nearly five times as much as would be needed for getting an unlimited supply of their own.

This closed the case for Bray; and that for Dalkey, which was practically the same as those of the other townships, was proceeded with.

The CHAIRMAN announced, in answer to an inquiry by Counsel, that the gas portion of the Bill would not be taken till after Whitsuntide; and the Committee adjourned.

Wednesday, May 20.

On the re-assembling of the Committee this morning, evidence on behalf of Dalkey was given.

Mr. *Eason*, one of the Dalkey Commissioners, said the complaint of the township was that they received water at a pressure of 250 feet only, and having houses as high as 350 feet, they had to erect pumping-stations and have engines, &c., to supply the higher levels. The intention of the Commissioners at the time of their agreement with the Corporation for a supply of water, and also the intention of the Corporation, was to provide a quantity which should be practically whatever might be found to be needed for private and public purposes. There was certainly no idea that it would be necessary to pay for excess water. They desired that the Corporation should have a fair price for their water—that was, they should get for it what would cover the interest, sinking fund, &c. If the Corporation would meet them, and give them a fair supply at high pressure and at a reasonable price, the Commissioners, he believed, would be very reluctant to part with the supply from Dublin.

Mr. *W. G. Strype* said he had prepared a scheme for supplying water to Dalkey, Blackrock, and Kingstown; and it could be carried out for £44,000, in a year or eighteen months. He thought the meterage system would be a fair one; but it would only be acceptable on the understanding that there must be a minimum supply—say, 30 gallons per head.

Lord *Ardilaun*, the Chairman of the Clontarf Commissioners, was then examined. He said the cost of distribution to the township amounted annually to £229. The Commissioners had had very numerous complaints as to the inadequate pressure at which the water was supplied. He was of opinion that 20 gallons per head per day was absolutely insufficient. He thought it was not reasonable that they should be asked to pay for excess water, as provided in the Bill. He regarded 30 gallons as a sufficient supply, and said this would be equivalent to 20 gallons some fifteen or twenty years ago.

Mr. *Donnelly*, the Town Clerk of Kingstown, put the requisite supply for Kingstown at 35 gallons. He said for £12,200 the Corporation of Dublin were supplying 240,000 people in the city, while they were getting £8490 for supplying 95,000 people outside. Under the present Bill, their charges would be raised to 5s. 6d. per head, as against 1s. in Dublin. Their rate would be raised to 10d. in the pound.

Mr. *A. Findlater*, as a resident of Kingstown, testified to the insufficient supply of water. He said he had satisfied himself that the scheme which was in contemplation in 1894 to give Kingstown an independent service was a feasible and workable one. Under it, it would be possible for the three townships of Kingstown, Blackrock, and Dalkey to get 40 gallons of water per head for the sum they were now paying the Dublin Corporation. The effect of the present Bill would be to increase the cost of their water supply by 100 per cent.

Mr. *Hassard*, re-called, stated that he estimated the Kingstown consumers paid five times as much for their water supply as the citizens of Dublin. In his opinion, no extension of the Vartry works was called for. Dublin had, in his belief, reached the limit of its population; and making due allowance for the increase of the townships, he thought that, with proper precautions against waste, the present water supply was sufficient. If more storage accommodation were needed, the Roundwood reservoir could be raised with very little cost.

Mr. *Strype*, re-called, stated that he had investigated a scheme by which water could be obtained for Kingstown at a cheaper rate than they paid now.

Mr. *B. Latham*, M.Inst.C.E., considered 30 gallons absolutely necessary for Kingstown. He corroborated Mr. Strype's statement that it was possible to get an independent water supply for Kingstown at a cheaper rate than the consumers were now paying.

This closed the Kingstown case.

Thursday, May 21.

On the resumption of the proceedings to-day,

Mr. PEMBER said that, in compliance with a request made to him by the Chairman the previous day, he wished, as representing the promoters, to put in a statement showing the actual cost of water per 1000 gallons to the Corporation of Dublin. The gross expenditure of the Corporation was £700,000. Deducting the amount chargeable for distributing mains inside the city, £88,000—or (say) £100,000—the sum of £600,000 was left. Interest at 4 per cent. on this amounted to £24,000; the cost of maintenance was £9000; 4 per cent. on the £80,000 to be spent on additional storage was £3200; and 4 per cent. on £80,000, the cost of completing the second line of pipes, was £3200. The total annual expenditure was thus £39,400. The cost of the water on (say) 12 million gallons per day would therefore be 2·158d. per 1000 gallons.

Mr. LITTLER addressed the Committee on behalf of Clontarf and Kingstown. He said the contention of the townships was that the Corporation had no right to refuse a further quantity of water than the number of gallons mentioned in the agreements. The Corporation complained of the excess; but this was in a very large degree due to their not having supplied at a proper pressure. Counsel proceeded to argue against the proposed rate of 3½d. per 1000 gallons; and said that no corporation ought to be allowed to make a profit out of the public. Clontarf was not properly supplied. If the Bill passed, it ought to have inserted in it a provision that, on giving reasonable notice—say, three or five years—the Commissioners should not be obliged to take any more water from the Corporation.

Mr. PEMBER then addressed the Committee for the promoters. He said he would endeavour, as shortly as possible, to bring the discussion back to the real lines on which the Committee would have to come to a decision. In 1861, before any of the townships were constituted, the Dublin Corporation had to consider the advisability of getting a supply of water; and by the Vartry scheme they were authorized to construct works for conveying and collecting water and supplying it to the inhabitants of Dublin and its vicinity. The Vartry scheme was more costly than others which were under consideration; but it possessed the advantage that it would afford facilities for supplying water to the population along the coast from Dublin to Bray. Against the increased cost which had to be incurred in carrying out the scheme was placed the revenue which would accrue from supplying those districts. When the townships came into existence, they entered into contracts with the Corporation, by which the water was to be supplied to them on certain terms. Four of these contracts specified that the Corporation should supply a quantity of water equivalent

to 20 gallons per head per day; and by two others, "not less than 20 gallons" per head per day was to be furnished. These words meant that the Corporation guaranteed to supply this quantity on the terms mentioned in the Acts; but the whole contention of the other side was that, because of a certain imperfection in the physical machinery, they were entitled to treat the words he had quoted as if they meant that they should obtain such quantity over 20 gallons as they pleased to take. If this was not sharp practice of the grossest kind, he did not know where to find it; and he fearlessly asserted that there was not a single person listening to him who would not be ashamed, in his private capacity, to put any such interpretation on those words. The Corporation, by their Bill, were not seeking to alter the bargain with the townships at all. They simply wanted to make it operative, and to prevent those townships from getting water to an unlimited amount at the same price as they had contracted to pay for 20 gallons. The townships of Pembroke, Killiney, and Kilmainham were honourable enough to pay for the water they consumed; and the other townships should do the same. He was of opinion that the most satisfactory method of settling the point in dispute in this case was that a certain amount per 1000 gallons should be paid for the water. This was a better arrangement than charging so much per head of the population, as there would be less possibility of disputes subsequently arising. The permanent charge on the Dublin Corporation in connection with the water supply was £39,400, excluding the cost of distribution; and as the total quantity of water delivered was something like 11 or 12 million gallons per diem, the actual cost of the water was 2·158d. per 1000 gallons. As the Corporation had to run certain risks—for instance, in connection with frost—he thought that 2·60d. would be a fair price to charge. The statement had been made that the rate of 5d. was fixed for Kingstown because the quantity of water was undefined; but the fact was that this rate was charged because Dublin had spent £12,590 on behalf of Kingstown. The promoters thought the townships should be made to pay what was right and proper; but the Committee, if they passed the water clauses in the Bill, could put in a proviso that any township might commute the payment for water at so much per 1000 gallons on the lines of the suggestion made by Alderman Meade. But he asked them, in the name of fairness, to pass the preamble; and it would be for their Lordships to consider whether there were any modifications which they might deem necessary and to which it would be within the scope of the inquiry to give effect.

The room was then cleared. On the re-admission of the parties,

The CHAIRMAN said: The Committee have decided that the preamble is proved, subject to the following conditions—viz., that at the end of clause 8 a proviso shall be inserted giving the various townships the power to go to the Corporation and claim to be supplied with water at the price of 2·60d. per 1000 gallons; and that as regards Kingstown, that township shall pay on the sums which have been mentioned in evidence, amounting to about £13,000, such interest as may be agreed upon between the Township Commissioners and the Corporation, or, failing agreement, as may be settled by arbitration.

Mr. LITTLER: As far as I am concerned, while I offer the strongest objection, I shall not be here to urge it. But there is one thing which your Lordships should bear in mind, and that is that Drumcondra and Killiney were struck out of the Bill.

The CHAIRMAN asked if Counsel appearing for the various townships would take the same course as Mr. Littler had indicated he would adopt.

Mr. LITTLER: Yes; I think so.

The Bill was then amended in accordance with the decision come to.

The Committee then adjourned; the Chairman intimating that it was possible there would be some change in their constitution when they met to consider the remaining portions of the Bill after Whitsuntide.

House of Commons Committee on London Water Bills.—This Committee resumed their sittings on Thursday last, and proceeded to further consider the Staines Reservoirs Bill. Mr. W. Hunter, the Engineering Director of the Grand Junction Water Company, who was under cross-examination when the Committee rose for the Whitsuntide holidays, gave further evidence, and he was followed by Mr. J. T. Mills, the Deputy-Governor of the New River Company, and by Mr. M. Hervey, the Engineer of the West Middlesex Water Company. The inquiry was continued on Friday, and then adjourned till to-day. A report of these proceedings will be given next week.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, June 2.

(*Before Mr. Justice* STIRLING.)

Sunlight Incandescent Gas-Lamp Company, Limited, v. The Incandescent Gas-Light Company, Limited.

This was a motion to restrain the defendant Company, its Directors, servants, and agents, until judgment or further order, from advertising or publishing any statement calculated to induce the belief that the mantles made by the plaintiff Company are an infringement of the defendants' patent, and also to restrain them from threatening customers.

Mr. GRAHAM HASTINGS, Q.C. (with him Mr. C. E. E. JENKINS), said the application was of a twofold nature—first, under section 32 of the Patent Act, to restrain threats, to which there did not appear to be any defence; and, secondly, to restrain the defendants from representing that the mantles sold by the plaintiffs were an infringement of defendants' patent. In 1895, the Incandescent Gas-Light Company brought an action against the Sunlight Company to restrain infringement of patent; and during the pendency of the action, the former Company undertook not to threaten or bring actions against customers of the latter Company. At the trial of the action, Mr. Justice Wills held that the Sunlight Company had not infringed the patent of the Incandescent Company, which was a valid patent; and in an action against the De Mare Company, he held that there had been infringement. Notwithstanding this finding, the Sunlight Company had lately discovered that the Incandescent Company were writing to customers. A letter to a Mr. Bates was put in and read, in which the Solicitors of the Incandescent Company said: "We are instructed that you have been using an incandescent light which is undoubtedly an infringement of our clients' patent. The patent has been in question recently in an exhaustive trial lasting over sixteen days; and it has been held by Mr. Justice Wills that all mantles with rare earths such as you have been using are an infringement of the patent in question." The letter concluded with a threat to at once institute proceedings unless the use of such mantles was discontinued. Advertisements had also appeared in several papers to the effect that judgment had been given against the Sunlight Company on the question of validity of the patent. Such advertisements were evidently intended to deceive; and he asked that the defendants should be restrained from further threatening customers.

Mr. MOULTON, Q.C. (with him Mr. TERRELL, Q.C., and Mr. WALTERS), for the defendants, admitted that there had been a slight mistake in the affidavit of Mr. Owen (defendants' Solicitor), and asked that the motion might stand over till Friday, to correct it.

His LORDSHIP ordered the motion to stand over as requested; but he directed that the defendant Company should pay all the costs incurred by the adjournment.

Friday, June 5.

On the hearing being resumed to-day,

Mr. MOULTON, having read an affidavit by Mr. Owen correcting an inaccuracy in a former affidavit, contended that the defendants were perfectly justified in writing the letter complained of. He also urged that he came within the proviso of the section; there being a pending action.

His LORDSHIP pointed out that Sunlight mantles were not an infringement of the defendants' patent; but this had not been stated in the letter. Mr. Justice Wills had arrived at the conclusion that "rare earths" were the essence of the defendants' specification; but the public would not understand what was meant by that.

Mr. MOULTON said this did not interfere with his right to tell the public that if they used mantles of rare earth they would infringe the patent of the Incandescent Company.

His LORDSHIP: But you are threatening people who, according to the evidence, are using Sunlight mantles. Do you propose to bring an action against Bates?

Mr. MOULTON said he had no doubt his clients would do so if their information should turn out to be correct.

His LORDSHIP: If you take proceedings against a man who is merely using a Sunlight mantle, I think you will run a great risk.

Mr. MOULTON: If we have threatened in respect of anything which is not an infringement of our rights, the Sunlight Company may bring an action against us.

His LORDSHIP: Are they not within their rights in making the present application? If they are persons aggrieved by the threats, they can apply.

Mr. MOULTON: But they must prove that the threat was in respect of something which is not an infringement of our patent. Proceeding to deal with the advertisement complained of, the learned Counsel contended that every word of it was true, and that, consequently, his clients had a right to issue it.

Mr. HASTINGS, in reply, said the defendants could not claim the benefit of the proviso in the section as to commencing proceedings to restrain infringement, as they had already given an undertaking in this action not to threaten customers.

His LORDSHIP (addressing Mr. Moulton): Are you willing to do this—first to inform Bates that your letter does not refer to Sunlight mantles; and, secondly, to omit from, or modify the statement in, your advertisement that "actions have been commenced, and are pending, against makers and sellers of all forms of incandescent mantles"?

Mr. MOULTON: With regard to the first point, certainly. As to the second, I may say that I advised my clients some days ago to strike out those words; and they now do not appear in the advertisements.

His LORDSHIP: Then upon that undertaking I shall make no order on the motion. The costs will be dealt with at the trial.

Saturday, June 6.

(*Before Mr. Justice* CHITTY.)

Incandescent Gas-Light Company, Limited, v. Fear.

Mr. WALTER, who appeared for the plaintiffs, said this was a motion for judgment in default of defence. He understood that a copy of the minutes had been signed by the defendant; but he would take it on affidavit of service. It was a claim for infringement of the plaintiffs' patents; and the relief he asked was an injunction, damages, and costs as between solicitor and client.

Justice CHITTY said the order would be according to the minutes for the injunction; costs down to and including the judgment; an inquiry as to damages; and liberty to apply in chambers as to the payment of the damages and subsequent costs.

(*Before Mr. Justice* NORTH.)

Incandescent Gas-Light Company, Limited, v. Henry.

This case came on as a motion for judgment in default of defence. The defendant, who was an infant, appeared by a guardian *ad litem*. According to the affidavit of the Assistant-Manager of the plaintiff Company, the defendant had carried on an extensive business in the manufacture and sale of mantles which were an infringement of the plaintiff Company's patent.

Mr. WALTER appeared for the plaintiffs.

His LORDSHIP made the order, and directed an inquiry as to damages. The costs of the inquiry were reserved, with liberty to apply.

MISCELLANEOUS NEWS.

THE LIVERPOOL CORPORATION AND THE GAS COMPANY.

An Important Report—Suggested Purchase of the Works.

With the summons issued to the members of the Liverpool Corporation for their meeting last Wednesday was a voluminous document, containing a report of the Special Sub-Committee of the Lighting Committee with reference to the gas supply of the city, and two resolutions on that report. The first recommended the Council to postpone the consideration of the report as adopted until the meeting of the Council to be held on July 1, and then that it should take precedence of other business on that occasion. The second resolution accepts the facts and figures collected and tabulated by the Special Sub-Committee, and then comes to an opinion contrary to that formed by the smaller body; for, while the Sub-Committee's conclusion was "not in favour of entertaining the purchase of the Gas Company," the Committee have approved and adopted the report "except the conclusion of the Sub-Committee" that they are "not in favour of entertaining the purchase of the Company."

The report of the Special Sub-Committee is explained in the opening paragraph: "In view of the large and important public interests involved in the matters referred to your Sub-Committee for consideration and report, it has been deemed desirable to institute a full and searching inquiry into the relations between the Corporation and the Gas Company—the character of, and conditions under which, gas is supplied to the consumers in Liverpool—the equipment and general management of the gas-works and cost of production, together with the past, present, and prospective financial aspect of the question. In addition to the valuable advice rendered to the Sub-Committee by Mr. Bellamy, the Gas Inspector to the Corporation, we have, by the courtesy of the Corporation of Birmingham, obtained the assistance of Mr. Hunt, the well-known and eminent Gas Engineer of that city. The Directors of the Liverpool Gas Company and Mr. W. King, the Engineer to the Company, have also very courteously, and with the utmost frankness, placed at the disposition of the Sub-Committee, information upon all matters as to which inquiries were made."

The report of the Sub-Committee (signed on behalf of the members by Sir Arthur Forwood) is as follows: "The conclusion, therefore, of your Sub-Committee is not in favour of entertaining the purchase of the Gas Company. There is, however, a necessity for some closer oversight of the gas undertaking in the interests of consumers; and the following suggestions to this end are made: Under the conditions on which the Gas Company supply gas in Liverpool, the consumers should have a voice in the management. This would be attained by the appointment on the Board of the Gas Company of two or more members of the Corporation; and this your Sub-Committee advocate. They also consider that, in the audit of the gas accounts, the Auditor representing the public should have wider powers to report upon the accounts, and that the judicial tribunal, to whom the report is submitted, should be invested with wider powers to compel a reduction to be made in the price of gas when justifiable. It would be decidedly to the advantage of the gas consumers that all further capital outlay that may be required for the extension of the works should be provided in greater proportion than heretofore by debentures instead of shares; and power might be obtained for the Corporation to invest its sinking fund in any gas stock or debentures to be issued by the Gas Company. Having regard to the changes now in progress, both in the cost and method of producing gas, your Sub-Committee are of opinion that no disadvantage is likely to accrue to the consumer by not pressing for alterations of the candle power for the present; but that improvements in the manufacture which would cheapen the cost of production are possible is evident, and the Directors of the Gas Company should be urged to take the necessary action. Accompanying this report are copies of the reports from the Town Clerk, the Gas Inspector, and Mr. Hunt, to which attention is respectfully desired."

The first section of the report gives the history and capital position of the Company. The Company have £1,239,100 ordinary stock and £306,083 debentures; while the auction clauses have realized in premium on sales £372,827 13s. 10d. Coming to the quality of gas, the Sub-Committee report that the present cost is enhanced owing to its high power (the minimum being 18 candles), estimated by Mr. Hunt at 2d. to 2½d. per 1000 cubic feet per unit of candle power and by Mr. King at 1d. per like standard. The process of enriching coal gas by the introduction of gas manufactured from water and oil is stated to be in Liverpool still in the experimental stage; and the experiment does not seem to be carried on under the most favourable circumstances. "It appears to the Sub-Committee that, on the whole, there is every probability that a reduction in the candle power to 16 candles would ultimately be found to be the best for the general consumers. Until, however, the cost of enriching the gas by means of oil has been more accurately ascertained, the Sub-Committee consider that a definite decision on the matter should be deferred."

As to the cost of production, about which the report truly says "the public mind of Liverpool has been considerably exercised," the report embraces tables giving the comparative cost of the production of gas in various towns. These deal with accounts to June 30, 1894, and show for Liverpool a very high cost for "coal"—viz., 20s. 7d. per ton. Two reasons were assigned by the Company for this—the accounts of 1894 embracing the period of the coal strike, when coal contracts could not be fulfilled, and abnormal prices had to be paid to supply immediate wants. The Sub-Committee considered that more reliable data could be obtained by comparing the accounts of the subsequent twelve months of three large towns where the Corporation manufactured the gas, and two—Sheffield and Liverpool—where it is supplied by private undertakings. From the table accompanying the report, it appeared that the average price per "gas ton" of carbonizing materials was, in Manchester, 13s. 4d.; Glasgow, 10s. 10d.; Birmingham, 10s. 3d.; Sheffield, 8s. 4d.; and Liverpool, 16s. 7d. To enable these prices to be fairly examined, the difference of candle power of the gas supplied in the various towns must be borne in mind. For example, 17·90-candle power gas in Sheffield was produced at a cost of 10·21d. per 1000 cubic feet, as against 21·55-candle power in Liverpool, which cost 19·6d. If the cost of enriching above 16-candle power was taken to be so high as 2d. per candle, the cost of the higher power in Sheffield would represent 17·34d., as against 19·6d. in Liverpool. If, however, the cost of enriching be taken at Mr. King's estimate of 1d. per candle, then the price in Sheffield would be 13·7d., as against 19·6d. in Liverpool. The prices of carbonizing materials, it was important to bear in mind, included the cost of enriching materials, and did not consist of coal alone. In Liverpool, coal, as the Committee were informed, now cost 11s. 8d. per ton. "It is very difficult," the Committee proceed to remark, "to draw a comparison between the cost of producing gas where the circumstances of quality, position as regards sources of coal supply, and capital charges are so varying."

To aid the Committee, therefore, in their investigation, they have obtained from Mr. Hunt a report on: (1) Whether the works are properly equipped for manufacturing gas on the most economical principles; and (2) whether the carbonizing materials used are the cheapest for the candle power required. As regards the works and plant, Mr. Hunt appears, on the whole, to have been favourably impressed; but he calls attention to desirable improvements, notably in labour-saving appliances, as well as to the existing multiplicity of small establishments. A copy of this report has been sent to the Gas Company for their observations. A perusal of the first portion of the report suggests to the minds of the Sub-Committee that, in regard to outlays for improvements, the interests of the gas manufacturers and those of the consumers are not, under present circumstances, so thoroughly identical as to induce the representatives of the shareholders to make those additions or alterations with the same freedom as they would were the conditions different, and the Company more directly interested in producing economical results. The attention of the Directors should, it is urged, be called to this point; and the Sub-Committee trust the Company will not hesitate to carry out improvements and make necessary additions to their works. The reply of Mr. Hunt as to whether the Company use the cheapest and best carbonizing materials for the candle power required is that "the selection is well and carefully made." He points out the difficulties of selection incident to the high candle power which, for economy, requires first-class coal to be purchased to minimize the use of costly enriching materials. He also adverts to the growing scarcity of cannel of high quality, and the restriction which a high candle power places upon the area of supply; and concludes by an expression of opinion that, by placing coal-gas plant at Garston, to be used in connection with oil gas, considerable economy of cost would ensue, and for similar reasons oil-gas plant is required at Linacre. The Liverpool Gas Company advertise for tenders for their coal, accepting the lowest of the suitable qualities offered. In the selection, they have to pay regard not only to price, but also to its gas-producing qualities; and this leads to questions and difficulties. The Directors contend that Liverpool is unfavourably situated as regards the cost of carriage, owing to the comparatively high amount of the railway charges.

In the sub-heads of expenditure given in the table appended to Mr. Bellamy's report, it will be seen that the manufacturing charges are 8½d. per 1000 cubic feet, which is under the average of the other towns. Distributing charges are approximately an average. In management expenses, corporate works are nearly ¾d. per 1000 cubic feet less than those of private undertakings. From the statement of the Liverpool Gas Company's capital account, not more than 12 per cent. of the total capital employed was issued to yield 10 per cent. to the undertakers; and only 15·6 per cent. of 7 per cent. stock. The remainder of the capital has been sold by public auction from time to time; and the premiums obtained have inured to the benefit of the gas consumers. Under such circumstances, there would appear to be no valid ground on which the Corporation can approach the Company with a prospect of success for a reduction of the statutory dividend, in order to obtain a reduction in the price of gas. Should the purchase of the undertaking be entertained; and the price paid be based on the present market values, the result would be that, allowing for a sinking fund, there would be no saving in the annual charge in respect to capital to the gas consumer, but the possibility of an increased cost, according to the view Parliament might adopt as to the period for repayment of the debt. At the same time, it would throw upon the ratepayers any risk that might arise from the supersession, in whole or in part, of gas by other illuminants. As regards saving in cost of manufacture, this, from the figures already given, is problematical.

Winding up a review of the report, a local contemporary says: The question of the purchase of the gas undertaking, and the relations between the Corporation and the Company, are not rendered less complex by the recent acquisition by the Corporation of the Electric Supply Company. The two undertakings of gas and electricity are not at present serious competitors; but improvements and discoveries as regards one or both may at any time bring them into close competition. It is more than probable that, under such circumstances, the users of either system of lighting will have an advantage by each being under distinct control rather than conducted under the same management. A further, but semi-political, consideration is the risk of centralizing, under a public elective body, large works employing considerable bodies of men, composed mainly of voters electing those who are to manage. In some towns, the gas companies are allowed to pay more than the maximum dividends to their shareholders, provided they make some corresponding reduction in the price of gas; but the Sub-Committee consider that, if it is possible for the Liverpool Gas Company to effect any saving in the cost of production, the whole of such saving (subject to the payment of the maximum dividends) should go to the consumers.

On the report coming before the Council last Wednesday, the resolution postponing its consideration to the 1st prox. was at once agreed to.

The Commercial Production of Acetylene.—A company has lately been formed in Antwerp, with a capital of £80,000, to produce acetylene on the Pictet system; and another in Rome, with a capital of £30,000, for a similar purpose.

THE LIGHTING CORPORATION, LIMITED.

Revival of Regenerative Gas Lighting in London.

Those of our readers who followed the fortunes of the Wenham Company will remember that about this time last year that undertaking was in a moribund condition. It had had an interesting—not to say remarkable—career. The Company started in Rathbone Place with a small capital in 1884; but so successful were their operations that much more extensive premises in Upper Ogle Street, Fitzroy Square, were taken, and the concern was reconstituted with £250,000 capital to keep it going. Business flourished, and for a time good dividends were paid. Then troubles arose, and the Company declined. On the 18th of July, 1895, the premises were put up to auction without securing a bid; and on the following Monday, the goodwill of the business and the patent rights were disposed of for £200. Thus in the space of about a dozen years was witnessed the introduction, development, and decline of a system of lighting which offered many advantages to gas consumers. The Company passed out of existence; but almost simultaneously there arose a new one to carry on the work—for the system remained, and there were many who thoroughly believed in it. Under the title of the Lighting Corporation, Limited, a company was formed with a capital of £75,000, in £1 shares, not only to exploit the Wenham lamp, but to do a great deal more. Their object, as set forth in their registration notice, was to "maintain and uphold any appliances, apparatus, or plant, requisite for gas, electric, oil, or any other methods of lighting now in vogue, and to carry on the businesses of manufacturers of, and dealers in, incandescent lights, and other apparatus for increasing the illuminating power of gas, spirits, oil, or other heat-producing agents, and suppliers of light, heat, electricity, and motive power." It was further specified that the Corporation would "undertake work as electricians, gas engineers, gas workers and fitters, manufacturing, analytical, and general chemists, chemical manufacturers, mechanical engineers, and ironmongers." Though the company have not made a very great noise in the short time which has elapsed since their incorporation, they are able to show a good record of work. They took the premises No. 4, Bloomsbury Street (a house which we believe was once occupied by Sir James Thornhill, the historical painter), and fitted up the rooms in such a way as to exhibit all the advantages possessed by the system of lighting with which they are mainly concerned—not, it should be stated, the old system, but a greatly improved one. Further, they made provision for carrying on an extensive business by securing an excellent site for new premises on the spot where for many years stood Bedford Chapel, at the corner of Oxford Street and what is now Shaftesbury Avenue—the chapel to which for some years the late Rev. J. C. M. Bellew attracted such large congregations of enthusiastic admirers, and wherein, till health failed, the Rev. Stopford A. Brooke carried on his ministry. On this site, which is within a few yards of the present premises, is to be erected a building of very effective exterior, and replete within with every convenience. Pending the completion of this establishment, however, the Directors have been utilizing the plant of the old Company, and taking steps to bring about an extended adoption of their system. Turning their attention to public lighting, for which they believed it to be well adapted, they fitted up three lamps in St. George's, Hanover Square—one at the top of St. James's Street, another in the middle of Piccadilly, and the third opposite the Junior Athenæum Club. These have proved so successful, that permission has been given by the Vestry for the erection of sixteen more lamps in Piccadilly. Coming to interior lighting, an important installation of the system has been provided on the premises of Messrs. Jones and Higgins, of Peckham; while another may be seen at the Blue Posts, in Tottenham Court Road. At the first-named establishment, the light is found to be admirably suited for the selection and matching of coloured articles; while at the latter the proprietor has adopted it in place of electric lighting. He had the latter illuminant laid on at an annual cost of about £400; but he became dissatisfied with it on the two very important grounds of inadequate lighting and defective ventilation. Seven Wenham lamps were fitted up by the Corporation, at a cost of £150; and he has now something like five times the amount of light, and moreover his house is properly ventilated, at an annual cost for gas and maintenance of less than half the amount he previously paid. The system is also in use at the Cavour Restaurant in Leicester Square, and at the Woolpack Restaurant in Gracechurch Street—eight large ventilating lamps having been put in at the latter establishment. An example of what the Corporation can do in the way of church lighting may be seen at St. Patrick's, Soho Square, where twelve lamps have been provided; and the suitability of the Wenham system for the illumination of a large printing establishment has been demonstrated at the new works of Messrs. Eden Fisher and Co., in Fenchurch Street, where 24 lamps have been fixed. The system has also been adopted in several other establishments; and business has likewise been done by the Corporation in other departments than that of lighting. In the supervision of all this work, in addition to which the whole of the plant and machinery had to be removed from the old factory to the new works and warehouse in Dyott Street and Charlotte Mews, W.C., the Chairman of the Corporation (Mr. S. H. Robinson), the General Manager (Mr. Charles Pond), and the Secretary (Mr. W. A. Gifford-Allen) have been unceasing in their efforts to start the new undertaking on a thoroughly satisfactory foundation.

Having, as the outcome of their past ten months' labours, some definite results to put before the public, the Directors last Tuesday invited a number of gentlemen interested financially or professionally in questions of lighting and ventilation, as well as representatives of the Press, to see for themselves what had been accomplished at the Woolpack Restaurant. A spacious room in the basement, which had only that morning passed out of the hands of the Corporation's workmen, was the one specially selected for inspection; and here nearly two hundred guests sat down to a banquet presided over by Mr. G. F. L. Foulger, the Chief Distributing Engineer of The Gaslight and Coke Company. On descending out of the bright sunshine of a June evening, the appearance presented by the room was gloomy enough; and the atmosphere was not particularly fresh. But when the gas was turned on, the whole of the place was bathed in a well-diffused light, which revealed to the assembled company the beautiful floral decorations which had been specially provided for the occasion by Mr. Welbore S. Ellis. As the banquet proceeded, the temperature of the room appreciably improved. In the course of his remarks in proposing the toast of the evening—"The Lighting Corporation"—the Chairman alluded specially to this fact, and pointed out that the improvement had taken place notwithstanding that most of the guests were smoking. This result was attributable to the system of lighting and ventilation adopted. He went on to say that gas companies are really not so black as they are painted; and that, if consumers would trust them, they would be only too anxious to recommend the best methods of lighting—in fact, it was to their interest to do so. With regard to the Company with which he had the honour to be connected, he could say unhesitatingly that they were always prepared to do this. He explained that he was not there as one interested in the Lighting Corporation to the extent of a penny piece, but simply as one who was concerned with giving the public the greatest value for its money; and he expressed the hope that his presence might not be misunderstood. He coupled with the toast the name of the General Manager. Mr. Pond, who was very cordially received, in responding, stated briefly the main objects and the policy of the Corporation. He said they were not bound to any particular system of lighting, and were only interested in the Wenham lamp to this extent—that, as they were advised, it was the most economical method of lighting, and that by it the best utilization of gas was obtained. If a better system were introduced to-morrow, the Corporation would be the first to adopt it. He then gave particulars of the various installations of the system which the Corporation have carried out, to which reference has been made above. The Hon. Howard Spensley proposed "The Press," which was responded to (among others) by Mr. F. Carruthers Gould, the eminent caricaturist, who stated that for 27 years he had never had gas in his house, because it vitiated the atmosphere; but from what he had seen of the Wenham light—especially its behaviour under the very severe test to which it had been put in that room—it seemed to approach the highest ideal of what a gas light should be. Mr. Pond proposed "The Chairman." He remarked that gas companies were most eager to assist anything which tended towards better lighting; and the presence of the Chief Distributing Engineer of The Gaslight and Coke Company was, he thought, sufficient testimony that the Company were endeavouring to support approved new methods of illumination. Mr. Foulger having briefly acknowledged the compliment, the entire company were conveyed in private omnibuses to the Duke of York's Theatre (which has been ventilated by the Corporation), the dress circle and stalls of which had been reserved for the occasion. On leaving the theatre, the guests were conveyed in cabs to the offices in Bloomsbury Street, where supper was served, and an opportunity was afforded of inspecting the magnificent suite of rooms in that historic house. One of these was without either window or fireplace; and yet, notwithstanding the smoking going on, the air was cool. It only remains to say that the hospitality of the Directors was fully appreciated by those who had had the privilege to partake of it; and it was acknowledged in suitable terms before the company separated.

ROCHDALE CORPORATION GAS DEPARTMENT.

Annual Report.

The report of the Gas Committee of the Rochdale Corporation for the year ending March 25 last reveals a very satisfactory increase in the consumption of gas—the total quantity produced being 437,513,000 cubic feet, which is an increase of 25,220,000 cubic feet, or rather more than 6 per cent. Of the increase, more than 7 million cubic feet was due to the greater use of gas for purposes other than lighting. The total consumption for these purposes is now upwards of 50 million cubic feet per annum; and this year it shows an increase of 18 per cent. The amount received for gas, however, is less than that of the preceding year by £1271. This is owing to a reduction of 3d. per 1000 cubic feet in the price, which took effect on March 25, 1895, and which, on the present consumption, represents £4700 per annum. Although the quantity sold was greater, the revenue from coke and sulphate of ammonia is considerably less than it was in the preceding year, owing to the exceptionally low prices of both these commodities. The falling off in revenue from these two sources alone amounts to £3773, and more than absorbs the advantage derived from the reduction in the price of coal. Nearly the whole of the works sanctioned by the Council in 1893, and for which power to borrow £65,000 was granted by the Local Government Board, have now been satisfactorily completed. To the present date, they have cost £57,015. The new retort-house has been in use since October last. The Committee are contemplating the re-construction of the old retort-house. In view of this, the contribution to the reserve fund from the revenue for 1894-5 was increased to £3000; a similar sum has again been set aside. After providing an additional sum for the sinking fund on account of the extensions—amounting to £823—the net profit handed over in aid of this year's rates is £6619. In concluding the report, the Committee say that careful attention has been given to the maintenance of the quality and purity of the gas throughout the year; the average of 267 tests giving an illuminating power of 18·17 candles. Appended to the report are returns as to meters in use, &c. These show the following totals: Meters, 23,125. Gas made in 1895-6, 437,513,000 cubic feet; in 1894-5, 412,293,000 cubic feet—increase of 25,220,000 cubic feet. In gas sold and used, an increase of 26,552,900 cubic feet is reported; the totals being 412,184,000 feet in 1895-6, against 385,631,100 feet in 1894-5.

An Additional Water Supply for Pembroke.—On the recommendation of the Water Committee, the Pembroke Town Council have resolved to procure an auxiliary supply of water from Slade, and to further consult Mr. F. Beesley, who has already submitted a scheme the estimated cost of which he places at £12,400.

INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at the Offices, Palmer Street, Westminster, S.W.—Major-General BERESFORD in the chair.

The SECRETARY (Mr. L. de Fonblanque) read the notice calling the meeting; and the report and accounts for the year ending March 31, of which a summary was published last week, were taken as read.

The CHAIRMAN, in moving their adoption, first made a short reference to the great loss the Company had sustained through the death of Major C. Jones, who joined the Board at the time of the reorganization of the Company in 1890. Commenting upon the balance-sheet, he said he was sure the shareholders would find it in all respects satisfactory; and it emphasized that steady increase in the business which had been so marked for the last three years. To enable the shareholders to see this clearly, he said the sales of burners for the year ending March 31, 1893, amounted to 20,000; in 1894, to 100,000; in 1895, to close on 300,000; and for the past year, double this number. The net profits for the year were £134,852, as against £78,196 for the preceding year; and adding the amount brought forward, they had a total of £149,307. Deducting the commissions payable to the Manager and Chemist, and after paying off £12,204—the whole amount standing to the English and new patent account—and after reserving £3937 as redemption of 20 per cent. of the 6 per cent. debenture issue and bonus, the balance available for dividend was £98,566. In April last, they paid an interim dividend of £7 4s. 6d. on each preference share and 3s. 9d. on each ordinary share, amounting to £74,928. There was, therefore, the sum of £23,638 available for final dividend. The Directors felt sure the shareholders would see the expediency of not devoting the whole of this sum to dividend; and they recommended paying a final dividend of 6s. 8d. on each preference, and 3d. on each ordinary share, which would absorb £3609; leaving a balance of £152 to be carried to the credit of next year's dividend on the ordinary shares, and carrying forward a balance of £20,136. It would be seen by the accounts that, on March 31, they held stock to the value of £75,000. It was absolutely necessary in their business that they should always have at disposal such an amount of stock, both for the purpose of meeting any sudden demand, and still more for being in a secure position in the event of any obstacles arising in the way of procuring their regular supplies. This was beyond question a satisfactory state of affairs; but what was still more satisfactory was the fact that the field for their enterprise was practically unlimited. Though there might be at present a million and a half of their burners in use in the United Kingdom, that represented a mere drop in the ocean as compared with the enormous number of gas-burners employed, a large portion of which, they had not the slightest doubt, would ultimately be fitted with their system. It was not easy to arrive at an exact, or even an approximate, calculation regarding the number of gas-jets in this country; but they had been informed that, in the Lancashire mills alone, more than 15 million gas-burners were in use. The Directors had received inquiries from shareholders which exhibited a certain amount of apprehension as to their policy in reducing the prices of the burners; and there was evidently a suspicion that the result of this policy would be to diminish the profit. This was certainly not so. At the time when the sales were comparatively small, it was essential, in order to cover the necessarily heavy fixed charges and to make a fair return to the shareholders, that the Company should get the highest possible price for the burners; but it was evident that there was a limit—and a limit which it did not take long to reach—to those gas consumers who would pay 15s. for a burner. Therefore, trusting that the reduction in price would result in an increased sale, and consequently in no diminution of profit, the Directors had, from time to time, lowered the prices until they had now brought them down to a figure which, while it yielded an exceedingly good profit, when sold in numbers such as were shown in the accounts, placed the burners within the reach of all classes of the community. The shareholders were aware that of late the Company had been exposed to a great deal of competition—partly lawful, chiefly unlawful; but it was astonishing, even to the Directors, that a mere feeling of curiosity did not induce the public to patronize more largely the competition burners put on the English market. The Directors, however, had not the slightest doubt that, as long as they continued to supply burners and mantles made in every way as well as they could be made, they would control the market in the future as they had done in the past. Regarding the litigation in which the Company had been and were engaged, he said that, in the De Mare case, judgment was given "all along the line" in their favour, and an injunction obtained against the De Mare Company, with costs. In the action against the "Sunlight" Company, they failed to obtain an injunction; but in both actions the construction put by the Judge upon their patents was such as virtually to give them the monopoly of the only successful system of incandescent gas lighting—*i.e.*, it was held that the Welsbach patents covered the use of all or any of the rare earths in the manufacture of the mantle. They had not the slightest wish to say anything unfair as to their opponents. If they could establish a remunerative business, it would be greatly to their credit; but the importance to them (the Incandescent Company) of the construction put by the Judge on their patent must not be underrated. An appeal had been entered against the judgment in the "Sunlight" case; and the De Mare Company had also appealed. Proceeding to give an explanation as to the position of the English Incandescent Gas Share Company (which was started for the purpose of giving the shareholders of this Company the opportunity of exchanging their ordinary and preference shares for shares of a more convenient denomination, and which could be dealt in on the market), he said that the Share Company was formed with a capital of £500,000, divided into 500,000 shares of £1 each. They offered 32 fully-paid £1 shares for each preference share, and three fully-paid shares for each ordinary share in this Company; and further, Mr. Julius Moeller, the General Manager of the Company, assigned to the new concern the commission payable to him in consideration of receiving 40,000 shares. At that time, the preference shares were quoted at about £38; and the ordinary, at about £2 10s. The advantage of the exchange was best testified by the fact that the equivalent value in the new shares for the preference shares and ordinary shares respectively was now about £56 and £5 5s.; but the equivalent value had been as high as £96 and £9 respectively. In conclusion, he said he had every confidence that the prosperity of the past would be maintained in the future.

Mr. F. WILLIAMS seconded the motion.

Mr. WIGAN, referring to an item "Sale of Licence to Irish Incandescent Gas-Light Company, Limited, £30,000," said it seemed to him that this was rather a capital receipt than one of income.

The SECRETARY remarked that it had been dealt with in accordance with the Articles of Association.

Mr. CHAMPERNOWNE inquired whether there had been a larger number of burners sold since the reduction in the price.

The CHAIRMAN replied that in the last two months there had been a very considerable increase in the sales.

The motion was unanimously adopted.

The dividend recommended having been declared,

Mr. J. Moeller and Lieut.-Col. Walter Ellis were re-elected Directors of the Company—the last named having been previously appointed by the Board to fill the vacancy caused by the death of Major Jones.

The Auditors were also re-appointed; and the proceedings then terminated with the usual complimentary vote.

BELGRANO (BUENOS AYRES) GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at Winchester House, Old Broad Street, E C.—Mr. C. P. OGILVIE in the chair.

The SECRETARY (Mr. H. T. Adkins) read the notice calling the meeting, and the report and accounts for 1895 were taken as read.

The CHAIRMAN said it was a true saying that "it is a long lane that has no turning." The Argentine Republic had gone through a very severe and long crisis. It appeared now that that crisis had come to an end—at any rate, it had stopped in its severity. The consequence was that almost all shareholders who had money in Argentine undertakings were in a better position last year and now than they had been in for several years past. The Directors were, therefore, able to lay before the shareholders a report, which, he thought, they would find satisfactory. The consumption of gas this year had increased by 17 per cent.—a figure which, he felt sure, would be gratifying to them. The consumption had been increasing since the bad times in 1890-91; though the crisis continued in its severity, yet all through that terrible time, the increase had steadily gone on. In 1891, the consumption was the same as in 1890; in 1892, the increase was 7 per cent.; in 1893, 9 per cent.; in 1894, 15 per cent.; and in 1895, 17 per cent. The expenditure which had been met out of revenue had been exceptionally heavy, owing to the Municipality having ordered the Company to take up some of the large mains from the roadways and place them in the footpaths. But this would be beneficial to the Company in the future, as they would be able to more easily make connections and repair the mains. The capital expenditure had amounted to a larger sum than usual; but it was an outlay which he looked upon as satisfactory. It would perhaps astonish the shareholders to know that the Company had, within the past five years, spent something like £50,000 on capital account; and yet the Directors had not applied to the shareholders for a single penny in the way of additional capital. If, however, they continued to extend the business at the same rate as now, they would, sooner or later, have to ask the shareholders for further capital. The capital expenditure last year amounted to £13,443. Of this £9000 had gone in new mains, and £2000 in services, which all represented new business; and in various improvements at the works—increased coal accommodation, and new scrubbers, washers, and purifiers—they had spent £2500. Dealing with the profit and loss account, he said that the Directors were able, early in the year, to pay the shareholders an interim dividend of 2 per cent., which absorbed £4000; and after paying the debenture interest, they had left £11,350. From this the Directors had written off £1509, being the amount outstanding on parliamentary and other charges. This item had been a blot on their accounts; and he was pleased to see it removed. Then they had added £2500 to the reserve account, as against £1000 last year. The Directors now proposed the payment of a dividend of 3 per cent. for the past half year; making a total of 5 per cent. for the year, which he thought was a satisfactory result. He called attention to the fact that the item "debtors in Belgrano" was somewhat larger than last year; the increase being due to the Municipality not paying up at the end of the year. They had, however, a reserve of £3000 for the purpose of writing off any loss that might accrue in getting their money from their customers, and probably this year they would have to deal with it. They had a Local Committee at Buenos Ayres, the President of which was Signior Toso; and he wished to put it on record how very much they owed that gentleman and his partners for the way in which they had managed the Company's business there. The Municipality had been able to reduce the indebtedness that was hanging over them at the end of 1895. The Directors believed they would be paid every dollar for the gas supplied to the Municipality, and also that the latter would fulfil the promise they had made to pay from day to day for the gas used. He moved the adoption of the report and accounts.

Mr. C. J. HEGAN seconded the motion, which was unanimously carried.

The dividend recommended having been declared,

The retiring Directors (Messrs. Ogilvie and Hegan) and the Auditors were re-elected.

The Chairman and Directors, Local Committee, and staff were also heartily thanked for their services.

Newport (Mon.) Water Supply.—At a special meeting of the Newport County Council on Monday last week, Mr. T. Canning brought up the report of the Parliamentary Committee, the principal recommendation in which was as to the promotion of a Bill by the Corporation next session for powers connected with the Wentwood water scheme, respecting which there has been considerable controversy.

WEST BROMWICH GAS SUPPLY.

The Annual Report.

At the Meeting of the West Bromwich Town Council last Wednesday, under the presidency of Alderman R. Farley, the Gas Committee reported that the total income for the year ending March 31 last was £37,223; and the total expenditure, £27,425—leaving a gross profit of £9798. Out of this there has been paid as interest on loans and Corporation stock and interest accruing thereon a sum of £5172; also as an instalment for the extinction of the stock, a further sum of £3253—leaving a net profit, or surplus for the year, of £1373. The balance of profits brought from the previous year was £9983, which added to the present year's surplus makes a total of accumulated profits of £11,356. The Committee proposed to transfer from the accumulated profits £1000 in aid of the general district rates of the borough. The Deputy-Mayor, as Chairman of the Gas Committee, in moving the adoption of the report, remarked that it had been four years since they had voted anything from the gas undertaking in aid of the rates. After transferring the £1000 proposed to the general district rate account, they will still have £10,356 as undivided profit, which was considered to be a fair working capital. They had of late years been expending considerable sums in making alterations at the gas-works and modernizing and improving the plant and appliances. Every provision was being made for the capital outlay; and in time to come the gas-works would become the absolute property of the town, without any incumbrance upon them. The report was adopted.

HEYWOOD CORPORATION GAS AND WATER UNDERTAKINGS.

Annual Reports of the Managers.

The Manager of the Heywood Corporation Gas-Works (Mr. W. Whatmough) has presented to his Committee his report on the working of the department for the year ending March 31 last. In it he deals first with the outlay on capital account; the total for the year having been £2620. Concerning the revenue account, he states that the gross income amounted to £18,575; and the gross expenditure, to £17,253—leaving a net profit of £1322. The receipts for gas sold for all purposes totalled to £15,701; being an increase of £1467. The total sum received for residuals is £2650; being £360 less than the previous year, and £705 compared with 1894. Although the quantity of coke and sulphate of ammonia sold shows a considerable increase, the receipts are reduced by £154 and £370 respectively—due to the decline in the value of these bye-products. The receipts for tar increased by £174. The expenditure on coal and cannel was £6329, against £6206, or an increase of £123 only—although 8,656,000 cubic feet more gas was manufactured. A small but interesting feature is the decreased expenditure on "rents, rates, and taxes" account of £84, due to the reduction of the poor-rate. During the year 1069 tons of cannel and 10,362 tons of coal were carbonized, or a total of 11,431 tons; being 844 tons more than in the previous year. The illuminating power of the gas for the year averaged 18 candles. The total quantity of gas manufactured was 110,784,000 cubic feet; being an increase of 8,656,000 cubic feet, or 8·47 per cent. The total amount of gas sold was 100,322,737 cubic feet; an increase as compared with last year of 9,441,923 cubic feet, or 10·38 per cent. The quantity of gas unaccounted for was 9,462,000 cubic feet, representing 8·54 per cent., as compared with 10·35 per cent. for 1894-5, or a saving of 2,004,000 cubic feet, which at 3s. 2d. per 1000 cubic feet amounts to £317. The following figures indicate the additional business secured during the year. The number of meters increased by 142 to 4779; public lamps, by 33 to 790; gas-stoves on hire, by 14 to 434; gas-stoves purchased, by 10 to 85; grillers and burners on hire, by 209 to 394; gas-engines, by 3 to 26; and prepayment meters, by 32 to 169. Mr. Whatmough also states that the maximum quantity of gas delivered in 24 hours was on Dec. 25 last, when 769,000 cubic feet were supplied, as compared with 669,000 cubic feet on the corresponding day of 1894. The minimum quantity of gas delivered in 24 hours was on June 3, when 81,000 cubic feet were supplied, as compared with 79,000 cubic feet on the same date of 1894. Towards the close of the report, Mr. Whatmough mentions that a lift which has been added to the largest holder has enabled him to deal more satisfactorily and economically with the heavy demands for gas in the darkest weather; and he concludes by congratulating the Committee on the successful result of the year's trading. Some working statements accompany the report. One shows that in the year 11,431 tons of coal were used; and 4589 tons of coke, 141,600 gallons of tar, and 130 tons of sulphate of ammonia were sold. As to the gas manufactured, the total was 110,784,000 cubic feet, of which 100,322,737 cubic feet were sold as follows: Private consumption, 81,450,262 feet; public lighting, 7,870,521 feet; prepayment meters, 907,404 feet; and stoves and motive power, 10,094,550 feet. The total quantity accounted for and the balance of stock was 101,321,937 feet; leaving as unaccounted for 9,462,063 feet, or 8·54 per cent.

The Manager of the Water Department (Mr. James Diggle) reports that, during the year, no less than 60 new mains were laid, varying in diameter from 2 to 18 inches, and of a total length of 16,000 yards. This work has necessitated a very heavy expenditure. The receipts for the year show that for domestic use there was an increase of £383; and for water sold by meter, an increase of £251. In Mr. Diggle's report for 1891, he alluded to the fact that the total income for water had increased by £1548 during the five years 1886-91. At that time, he expressed an opinion in favour of a continuation of the same ratio of increase. He is now pleased to be able to report that the total annual income for water in the past five years, 1891-96, has increased by £2885, which fact, he thinks, must be most encouraging to the Committee. Had the revenue account for the past year not been subjected to the extraordinary charges for the renewal and repair of mains, and the additional contribution for the reduction of water annuities, he should have had the much-longed-for satisfaction of reporting a result free from actual loss.

ELECTRIC LIGHTING NOTES.

At last the report of the Electric Light Department of the Hampstead Vestry is in print, and will be formally presented to the Vestry at their next meeting. The author is Mr. Arthur P. Johnson, M.A., the Vestry Clerk, who has fairly set forth the state of affairs with a frankness that should be appreciated by the ratepayers, even if they are not impressed with the curious progress made by this experiment on the security of their rates. Mr. Johnson prefaces the hard facts with an interesting narration of the circumstances leading up to the inception of the undertaking, and then refers to the public lighting. "Considerable difficulty," he says, "was experienced by the failure of the armatures of the arc machines; . . . then the arc lamps gave some trouble; and finally your Committee found that the lamps, when in working order, were placed too near together, and determined to have their position altered." On the other hand, Mr. Johnson considers that "the Vestry may look back with satisfaction on the result of the private lighting for the period under review. It is true that at first the engines did not run well in parallel; but this defect was soon remedied. . . . When the station started running on the 1st of October, 1894, 13 consumers, with an equivalent of 1648 8-candle power lamps, were connected to the mains. On the 31st of December, 1895, the number of consumers had risen to 246, with an equivalent of 19,407 8-candle lamps." The accounts are then appended and reviewed; and we are told that these 246 consumers were supplied after a gross capital expenditure of £56,522. Of this amount, £5000 has been lent by the London County Council, £24,400 by the Prudential Assurance Company, and the remainder temporarily by the Vestry's bankers, save a small amount of £1160—the valuation of the site of the central station, the freehold property of the Vestry. This £56,522 has been appropriated as follows: Mains, including house services, arc lamps, &c., £26,968 15s. 1d.; buildings, £10,202 2s. 1d.; machinery, £13,384 4s. 1d.; and the remainder for transformers, meters, instruments, general stores, and preliminary expenses. Then comes the revenue account, which shows a sad state of things—viz., a loss of £1002 9s. 2d. on the actual working of the station for the 15 months, without taking interest on mortgages into account at all. The expenses of working were £5608 17s. 9d., made up as follows: Generation (fuel, oil, repairs, wages at station, maintenance of machinery, &c.), £3658 15s. 8d.; distribution (wages to fitters, repairs to mains, transformers, and public lamps, rates and taxes), £655 19s. 4d.; management (salaries, stationery, and general establishment charges), £1114 17s. 7d.; and special charges (insurances and discount), £179 5s. 2d. Against these, £4462 3s. 8d. was received from sale of current, £141 11s. 5d. as rental of meters, £2 12s. 6d. for certification of meters, and 1s. for the sale of a Provisional Order—leaving the balance of £1002 9s. 2d. already mentioned. This loss is increased to £2916 5s. 3d. when the various interests on mortgages and temporary loans and the instalments of principal are repaid. This £2916 5s. 3d., says Mr. Johnson in his report, "seems at the first blush a large amount; but it must be remembered that a large proportion of the staff at the station was appointed several weeks before the 1st of October; and further that interest was accruing on the capital expended, and consumable stores, such as coal, oil, &c., were used some considerable time before the current was supplied to consumers. To this again must be added the fact of the large capital expended on extensions of mains, amounting to nearly £26,000, which brought in comparatively little revenue during the period under review." The report also states that "negotiations are at present on foot with the London County Council for a further mortgage of £30,000 with which to wipe off the temporary loan." The Electrical Engineer (Mr. G. H. Cottam, M.Inst.C.E.) has prepared an interesting chart in curves representing the capacity and output of the station. This is appended to the report. Up to the end of the year, the 246 customers used 96,184·6 units with 19,407 8-candle lamps (equivalent). It remains for the ratepayers themselves to say whether they are satisfied with an experiment which has cost them £56,000, the manipulation of which in 15 months has resulted in a loss of £2900. Hampstead is luckily a rich parish, and the residents are mainly of the well-to-do classes. To this fact, and to the general apathy with which vestry doings are usually treated by the ratepayers of the Metropolis, may be attributed the strange defeat, at the recent election, of the two more pronounced opponents of the scheme on the Vestry. Who will now deny that one of them was not at least under great provocation, when he charged the Chairman of the Committee with delaying this report for election purposes?

The Colchester Town Council have determined to proceed at once to establish the electric light in the town; and to that end they have agreed to accept a tender by the Electric Construction Company to carry out the work for £10,675, with fixed charges in respect to current supplied for temporarily lighting the military hospital. The buildings will cost £2500; and it has been decided to apply to the Local Government Board for sanction to the borrowing of £15,000.

From the report of the Electric Lighting Committee of the Oldham Corporation, we learn that the total expenditure on capital account during the past financial year was £6289. The gross revenue amounted to £3847; and the expenditure, to £1578—the balance carried to net revenue account being £2269. Deducting £1422 from this for interest on loans and instalment of sinking fund, there is a net profit of £847; and adding £902 brought forward from the preceding year gives £1749 to be placed to the credit of the year just started. The amount of energy generated has been 179,966 units, of which 147,432 units have been sold, being increases over the previous year of 93,599 units and 78,434 units respectively. The number of lights supplied on March 25 last equivalent to 8-candle power was 11,830; being an increase of 4890. On March 25 there were 113 consumers and 125 meters fixed. An application for additional borrowing powers to meet the growing demand for the light has been acceded to by the Local Government Board to the extent of £15,000. A sum of £500 received from the Gas Committee has been paid to the Sanitary Committee towards the cost of erecting a new chimney at the destructor works adjoining the supply station; and they in return have agreed to furnish the station with the surplus steam generated there, which, it is expected, will effect a material reduction in the cost of generation.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual accounts of the Perth Gas Commission have now been published. They were considered by the Works Committee on Monday last, and will be before the Commission on Monday first, for approval. As I stated last week, the revenue amounted to £20,783; and the expenditure, to £15,753. Of the total revenue, £18,315 was derived from gas, and £2380 from residuals and coke. The credit balance amounted to £5030, which, added to the balance of £90 brought forward a year ago, makes £5121. Of this sum, £2812 is applied to payment of annuities, £704 to interest on debt, £1000 to the sinking fund, and £500 to the contingency and depreciation of works fund—leaving the sum of £105 at the credit of the net revenue account. The balance at the credit of the sinking fund has decreased during the year from £1573 to £1315; but the balance of debt has been reduced from £14,000 to £12,500. The contingency and depreciation of works fund shows a credit balance of £2035, as against £1490 last year. Of this fund, £1761 has been invested in purchase of £920 of Perth gas annuity stock. In the general balance account, the assets, including £1606 in bank and on hand, are set down at £108,066. The liabilities include £90,000 as the value of the annuities, and £12,500 of bonded debt. Appended to the accounts is a statement as to the quantity of gas delivered and the price per 1000 cubic feet in Perth, and the percentage of unaccounted-for gas annually since 1873. In that year, the quantity delivered was 40,948,500 cubic feet, at 5s. 10d. per 1000 feet; while the unaccounted-for gas amounted to 13·19 per cent. In the year just closed, 115,167,900 cubic feet were delivered, at 3s. 6d. per 1000 feet, and the percentage of unaccounted-for gas was 10·64. The expenditure for the current year is estimated at £20,824. Bailie Wright, the Convener of the Committee, said that, while the totals of the revenue and expenditure were pretty much as anticipated, the different accounts had varied considerably. The estimated expenditure for the current year had been based on a footing which was likely to be sufficient to cover all necessaries. On the revenue side, it was estimated that 3½ million cubic feet more gas would be sold; and it was proposed to discontinue the charge for meter-rents. Last year £442 was obtained from this source of revenue. The members of the Works Committee were unanimously in favour of meter-rents being abolished. The revenue from gas was £190 higher than in the preceding year, notwithstanding that the price of gas was 3d. per 1000 feet lower; and it was £600 above the amount estimated for the year. This result was brought about by the fact that the quantity of gas sold was 18,667,000 cubic feet over the quantity sold in 1894-5, and 18,467,000 cubic feet over the estimate for the year. The undertaking is altogether in a healthy condition. A year ago, 3d. per 1000 feet was taken off the price of gas; and this year meter-rents are being abolished. These concessions will doubtless have a favourable effect on the business done, and lead to further betterment. So far as the Commission itself is concerned, there is matter for gratification in the improving position of the sinking and depreciation funds.

The working year of the Hamilton Corporation gas undertaking has turned out well, though not up to what it was in the preceding twelve months. As yet, the balance-sheet has not come out, so I cannot give the figures; but I understand that, after meeting all charges, including interest on £29,130, there is a surplus of £300. In addition, a good deal of revenue was devoted to extensions of works, which might have been charged to capital. There was an increase in the output of gas of over 15 million cubic feet; raising the output to 96 million cubic feet for the year. In connection with this part of the working, it may be stated that the maximum daily output was three times the capacity of the gasholders. This is not a position which any manager would envy—and, indeed, it is not Mr. Ewing's fault that it was so. He had to face much opposition to his proposals for extensions, with the result that, instead of getting the work started in March, it was not till June that it was commenced. It was impossible to complete it before the winter; and the want of the new plant made the working a matter of great anxiety and difficulty. For the same reason, it was not possible to obtain the same working results as in the year before last. However, with the new plant, which is now nearly ready, it is anticipated that the works will again show the brilliant results which were formerly obtained. Though not quite up to Mr. Ewing's desire, the outcome of last year's working was such as, taking into account the benefits to be derived from the new plant, to induce him to propose that the price of gas should be reduced from 2s. 1d. to 1s. 10½d. per 1000 cubic feet, and that the charge for the hire of gas stoves and cookers should be abolished. I have already pointed out that, with 25-candle gas at 2s. 1d. and no meter-rents, Hamilton has the cheapest gas in Scotland, and, relatively speaking, the cheapest in the United Kingdom. Taking the parliamentary returns, the very lowest priced gas is that supplied by the Plymouth Company, at 1s. 9d. per 1000 feet; but then that is for 16-candle gas, and meter-rents are charged. The only other places where the charge is less than 2s. 1d. are: Widnes, 1s. 10d. per 1000 feet, for 18½-candle gas; Newcastle and Gateshead, 1s. 10d. for 16½-candle gas; Sheffield, 1s. 10d. for 17-candle gas; York, 1s. 10d. for 16-candle gas; and Sunderland, 2s. for 15½-candle gas. But in all these places meter-rents are charged. To be as cheap as Hamilton gas at 2s. 1d., Plymouth gas should be sold at 1s. 4d. per 1000 feet; and if the price in Hamilton had been reduced to 1s. 10½d., in Plymouth it should be 1s. 2⅛d. These figures show the foremost position, in the matter of price, to be held by Mr. Ewing. He has not, however, carried his proposals at present. His Committee did not adopt them, but recommended that the price of gas should be retained at 2s. 1d., and that the charge for stoves should be reduced from 10 to 5 per cent. Mr. Ewing's estimate was that, if the year were a fair one, there would be a gross profit of £4050, out of which they would have to pay £1020 as interest upon £34,000; and if they allowed £1020 for sinking fund or depreciation, they would have £2010 net surplus. Even if they reduced the price of gas as proposed, and abolished stove-hires, there would be £967 over. The idea of the Works Committee, however, is to endeavour to get money in hand with which to reduce the capital account; and the Commissioners adopted their views. The position of the capital account is this, that in 1880 it amounted to £28,235, while in 1895 it had been reduced to £15,350. The cost of the present extensions—amounting to £20,000—has raised it to about £35,000. Some of the Commissioners are afraid that this is too large a sum to write down by ordinary contributions to the sinking fund; but the fear is groundless. The capital account may be held as closed for the next twelve or fifteen years; and if £1000 or more be written off every year, the account will, by that time, be reduced to a sum below which it would not be advisable to go, unless it were proposed to make a gift of the gas-works to posterity. Even at the full figure of £35,000, the annual charge does not amount to more than 2⅛d. per 1000 cubic feet of gas. In Glasgow, the capital charge is over 3¼d. per 1000 feet; and in Edinburgh, it is over 6d. With such a light burden, there is no need to be in haste to reduce liabilities; and so, after all, the Manager was right. The Commissioners have resolved to institute an accident insurance fund for their workmen, by setting aside annually from the profits a sum equal to 1½ per cent. on the men's wages. An insurance company offered to insure the men for 11s. a year each; but the Commissioners think they can do it cheaper themselves. The step is a wise one. The only part of the scheme which is not complete is as to whether the men are to be asked to contribute to the fund. If so, the benefits would be higher. I should think the men ought not to be partners in the fund, unless there were to be a provision for old-age pensions, which would lead to too much complication of the scheme.

The Town Council of Aberdeen this week agreed to the rise in wages to the workmen which I mentioned last week. The wages as now fixed are as follows: Retort-house foremen, from 33s. to 34s. per week; machinemen, 28s. to 29s. per week of 56 hours; machine assistants and hand stokers, 26s. 10d. to 28s.; barrowmen to machines, 24s. 6d. to 25s. 6d.; assistants to hand stokers and potmen, 23s. 4d. to 24s. 6d.; mechanics, blacksmiths, masons, and joiners, maximum rate from 31s. to 32s., workmen not at present at maximum rate to receive an advance of 1s. to 1s. 6d.; meter repairers, maximum rate from 24s. to 27s. per week of 51 hours, workmen who have not reached the maximum to receive an advance of 1s.; pipe-layers and fitters, maximum rate from 26s. to 27s., workmen who have not reached the maximum to receive an advance of 1s.; carters, from 22s. to 23s.; and foremen of pipe-layers and meter inspectors, from 30s. to 32s. The total cost will be about £500 a year. The subject of lighting the harbour was before the Council. At present the quays are lighted by gas, and the cost is borne equally by the Harbour Trustees and the Corporation. The Harbour Trustees propose to light them by electricity, taking the current from the Corporation. The question of providing the supply and the cost of it, was sent by the Corporation to the Gas and Electric Lighting Committee to consider, and the question of the city's contribution to the cost was sent to the Watching and Lighting Committee.

The Broughty Ferry Corporation gas undertaking, which is managed by Mr. A. Waddell, has just closed a year so prosperous that it is probable there will be, as there was during each of the last two years, a reduction of 5d. per 1000 cubic feet in the price of gas—from 3s. 4d. to 2s. 11d. Three years ago, the price was 4s. 2d. per 1000 feet. The reduction is attributed chiefly to the working of the Peebles oil-gas process.

The Barrhead Gaslight Company, which is managed by Mr. J. W. Carmichael, after providing for depreciation and other charges out of profits, have divided 7½ per cent. as dividend, and 2½ per cent. as bonus, and have reduced the price of gas for the current year.

The Motherwell Police Commissioners two months ago decided to delay proceeding with the introduction of an installation of electric light. Such, however, is the zeal of those who take up this subject that, at this week's meeting of the Commissioners, the gentleman who previously moved in the matter again brought it forward, and moved that their decision should be reconsidered. His argument was that he was told by Mr. Mavor, of Glasgow, whom they had consulted, that nothing would be gained by delay; and that unless they went forward, private installations would be introduced. The Commissioners, by a majority, refused to reconsider their previous decision. A motion that a Committee be appointed to look into such matters as the taking over of the gas-works, building new works, or buying gas in the cheapest market, was sent to the Water and Lighting Committee to consider.

At a meeting of the Finance Committee of the Edinburgh and District Water Trust on Wednesday, the Treasurer submitted a statement showing the expenditure and revenue of the Trust for the year from May 15, 1895, to May 15, 1896. The estimated expenditure of the Trust was £87,675; the actual amount was £88,151—being only £475 over the estimate. The estimated revenue from rates was £89,416; the actual amount was £92,247—being £2831 in excess of the estimate. The gross revenue amounts to £94,950, showing a surplus over expenditure for the year of no less a sum than £6799. This was remarked upon as a very gratifying result of the year's finance. There is every reasonable prospect of the new works in connection with the Talla scheme for an additional supply being executed without any addition to the present low domestic rate of 5½d. per pound—at least during the course of construction.

A question, or rather three questions, relating to the assessment of traders for water, has been decided this week by Sheriff-Substitute Henderson at Cupar. The general Police Act of 1892 contains a provision that business premises shall only be assessed on one-fourth of the rental, unless, in special circumstances, the local authority should see cause to charge the ordinary rate. In the burgh of Leven, Fifeshire, the Police Commissioners, as local authority, imposed an assessment on the full rental, and also, in some cases, a special rate for water supplied for business purposes. In reply to representations against this practice, they said that the provision of 1892 could not have been intended to apply in the case of assessments for water-works which were in existence at the time of the passing of the Act; otherwise the security for the payment of interest on borrowed money would be diminished. In their case, they had expended £18,000 upon water-works; and in security, they had pledged the rates to be levied for water in the burgh. Appeals were taken to the Sheriff by about forty traders, divided into three classes: (1) Shopkeepers who did not use water in connection with their business—such as drapers—and who were assessed simply upon the full rental; (2) shopkeepers who did use

water in connection with their business—such as grocers—and who were assessed specially, as well as upon the full rental; and (3) hotel-keepers and others, upon whom a special charge was made in respect of their large consumption of water. Sheriff-Substitute Henderson has dismissed the appeals by the first class, and found them liable in expenses. He maintains that before the Legislature could be held to have diminished so greatly the security upon borrowed money, something much more express than anything in the Act of 1892 must be enacted. In the second class, he finds that the appellants have been improperly assessed for water upon both the full rental and also for a special water-rate; but he finds that they have been rightly assessed upon the full rental, and to that extent he dismisses the appeals, with expenses. In the third class, he has sustained the appeal, with expenses. The mistake, he thinks, which has been made in the form of the assessment, can easily be remedied in subsequent years; and the appellants will then have to elect between a special water-rate and the use of a meter. For the year under consideration, the local authority must suffer the loss of their special water-rate. These are three important decisions upon questions which have cropped up in not a few burghs in Scotland.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June 6.*

Sulphate of Ammonia.—There has been a fair demand having regard to the season of the year reached; and prices are about maintained. In England, where the make is nearing its minimum, such parcels as have been put on the market have found a ready sale. In Scotland, however, where the make is much the same in summer as in winter, there are indications of weakness, and a disposition to accept the lower prices now being offered. The quotations are £7 18s. 9d. Leith, £8 to £8 2s. 6d. f.o.b. other ports. In the forward position, sellers' and buyers' ideas continue divergent. Hence not much business is actually being done.

Nitrate of Soda is quiet in all positions, though spot price for fine quality remains 8s. per cwt.

LONDON, *June 6.*

Tar Products.—Creosote and common oils, which have been a great drug in distillers' hands, are now moving off more freely. The increased use of naphthalene for various purposes has materially diminished the quantity of available creosote. Benzol enjoys a steady market with a firming tendency. Pitch is steady; and buyers are now negotiating their requirements for the ensuing season. The oft-repeated assertion that there is a large over-production of pitch seems now to be without foundation. The stocks held in makers' hands are unusually small; while buyers, though fairly well supplied, are becoming a little anxious as to the future. The very low prices now obtaining for coal will prevent any important advance in the value of fuel; and therefore pitch is unlikely to see any substantial increase in price. A dull market characterizes anthracene; and no new business is reported.

Average values realized during the week are: Tar, 18s. 6d. to 24s. 6d. Pitch, 32s. to 34s. Benzols, 90's, 2s. 5d.; 50's, 2s. 2½d. Toluol, 1s. 9d. Solvent naphtha, 1s. 3½d. Crude, 30 per cent., naphtha, 9½d. Creosote, 1½d. Salts, pressed, 50s.; drained, 32s. 6d. Cresylic acid, 1s. Carbolic acid, 60's, 1s. 11d. Anthracene, nominal, "A," 10½d.; "B," 8½d. to 9½d.

Sulphate of Ammonia presents no new feature. The market is fairly steady at firmer quotations. Stocks are small; and there appears no urgency on the part of makers to sell. Shipments continue good, and prices range between £7 17s. 6d. and £8 2s. 6d., less 2½ per cent. in all positions. Gas liquor is nominally quoted 6s. to 7s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The gas-coal season may now be said to have fairly commenced; tenders for several of the largest contracts in this district having been already sent in. It is as yet too early to express any decided opinion as to what actual prices are likely to be; but it may be safely stated that they will not be any higher than last year. In all probability, they will be a trifle lower; the tendency so far in many cases having been a shade under the prices taken last season. The giving way is not so much on the best qualities of Arley gas coal, for which 7s. per ton at the pit seems to be about an verage figure, but chiefly on the commoner sorts; 6s. to 6s. 3d. being reported as about the average figures for Wigan four-feet gas coals. The tendency is more and more to purchase the cheapest class of coal that can be obtained for gas-making purposes; the gas companies enriching, not as in previous years with the expensive cannels, but with oils. Tenders are consequently, in the majority of cases, being based upon the price of the commonest descriptions of round coal that can be made suitable. In the general coal trade, the position shows no improvement upon the depression prevailing previous to the holidays; most descriptions of fuel hanging upon the market, with prices, so far as round coal is concerned, weak and irregular. For the better qualities, suitable for domestic consumption, there is necessarily, with the present hot weather, only the most limited possible demand, with an easing tendency in prices; and though list rates are without quotable change, these are little more than nominal. As regards steam and forge coals, competition continues exceedingly keen; and to secure orders of any weight, prices are cut extremely low. Engine fuel is rather more plentiful in some quarters—especially where pits have not been closed over so long a period for the holidays; while the mill stoppages have necessarily restricted requirements for engine purposes. Prices,

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 1267).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Apl.	10½	Alliance & Dublin 10 p. c.	25—26	..	4 0 9
100,000	10	,,	7½	Do. 7 p. c.	17—18	..	4 3 4
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	110—112	..	4 9 3
200,000	10	16 Oct.	5†	Belgrano (B. Ayres), Limited	9½—9¾	..	5 2 7
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	100—105	..	4 15 3
200,000	5	29 May	6½	Bombay, Limited	7½—7¾*	..	4 3 10
40,000	5	,,	6½	Do. New, £4 paid	5¾—6*	..	4 6 8
380,000	Stck.	27 Feb.	12	Brentford Consolidated	285—290	+3	4 2 9
210,000	,,	,,	9	Do. New	217—222	..	4 1 0
50,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
159,375	,,	16 Dec.	4	Do. 4 p. c. Deb. Stock.	130—135	..	2 19 4
220,000	Stck.	27 Mar.	11	Brighton & Hove Original	237—242	..	4 10 11
208,820	,,	,,	8	Do. A Ord. Stk.	190—195	..	4 2 0
933,500	Stck.	27 Feb.	5	Bristol, 5 p.c. max.	127—132	..	3 15 9
420,000	20	27 Mar.	11½	British	56—57	..	3 18 11
50,000	10	12 Mar.	11½	Bromley, Ordinary 10 p. c.	22½—23½	..	4 17 11
71,000	10	,,	8½	Do. 7 p. c.	19—20	..	4 5 0
500,000	10	29 Apl.	5	Buenos Ayres (New) Limited	9¼—9½	..	5 2 7
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	103—105	..	5 14 3
150,000	20	27 Feb.	8½	Cagliari, Limited	29—31	..	5 6 5
100,000	10	29 May	8	Cape Town & District, Ltd.	16½—17½*	..	4 11 4
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58—60	..	5 0 0
550,000	Stck.	15 Apl.	13½	Commercial Old Stock	340—345	..	3 18 2
165,000	,,	,,	10½	Do. New do.	258—263	..	2 19 10
165,000	,,	16 Dec.	4½	Do. 4½ p. c. Deb. do.	147—152	..	2 19 2
800,000	Stck.	16 Dec.	13	Continental Union, Limited.	285—290	..	4 9 8
200,000	,,	,,	10	Do. 7 p. c. Pref.	218—223	..	4 9 8
51,600	Stck.	27 Feb.	14	Croydon Com'cial A 10 p. c.	—	..	—
157,500	,,	,,	11	Do. B 7 p. c.	—	..	—
535,000	Stck.	27 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	130—135	..	3 17 9
60,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
486,090	10	30 Jan.	11	European, Limited	26—27	..	4 1 6
354,060	10	,,	11	Do. £7 10s. paid	17½—18½	..	4 9 3
5,746,590	Stck.	13 Feb.	12¾	Gaslight & Coke, A, Ordinary	310—315	+2	4 0 11
100,000	,,	,,	4	Do. B, 4 p. c. max.	108—113	..	3 10 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	297—302	..	3 6 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	145—150	..	3 6 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	210—215	..	3 9 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	205—210	..	3 6 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	295—300	..	3 6 8
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	172—177	..	3 7 10
1,061,150	,,	16 Dec.	4	Do. 4 p. c. Deb. Stk.	140—145	..	2 15 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	150—155	..	2 18 0
908,000	,,	,,	6	Do. 6 p. c. do.	204—209	..	2 17 5
70,000	10	14 May	6	Hongkong & China, Limited	12½—13½	..	4 8 10
5,800,000	Stck.	14 May	12	Imperial Continental	248—252	+2½	4 15 3
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	100—103	..	3 17 8
473,600	Stck.	13 Feb.	3½	Do. 3½ p. c. Deb. Stk	108—110	..	3 3 8
75,000	5	16 Dec.	6	Malta & Mediterranean, Ltd.	6½—7	..	4 5 8
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	115—118	..	4 4 10
250,000	100	,,	4½	Do. 4½ p. c. Debs.	110—112	..	4 0 4
541,920	20	14 Nov.	5	Monte Video, Limited	17—18	..	5 11 1
150,000	5	29 May	8	Oriental, Limited	8¼—8¾*	..	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7½—7¾*	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1—2*	..	4 0 0
60,000	5	12 Mar.	7	Ottoman, Limited	5—5½	..	6 7 3
166,870	10	—	2	Para, Limited	1¾—1¾	..	—
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds..	105—110	..	5 9 1
500,000	100	1 June	6	of Chicago } and Do.	102—107*	..	5 12 1
250,000	10	27 Mar.	8	San Paulo, Limited	13—14	..	5 14 3
500,000	Stck.	13 Feb.	15½	South Metropolitan, A Stock	405—415	..	3 14 8
1,350,000	,,	,,	12	Do. B do.	315—320	..	3 15 0
310,000	,,	,,	13	Do. C do.	335—340	..	3 16 6
800,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	175—178	..	2 16 2
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	250—255	..	4 10
60,000	,,	,,	8½	Do. B	—	..	—
170,380	10	29 May	10	Tuscan, Limited	13½—14½*	..	6 18 0
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	100—102	..	4 18 0

WATER COMPANIES.

746,021	Stck.	30 Dec.	10½	Chelsea, Ordinary	347—352	+2	2 18 3
150,000	,,	,,	5	Do. 5 p. c. Pref.	172—177	..	2 16 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	—	..	—
175,785	,,	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	158—163	..	2 15 2
1,719,514	Stck.	15 Apl.	7	East London, Ordinary	245—250	..	2 16 9
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	157—162	..	2 15 6
100,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105—107	..	2 16 1
700,000	50	16 Dec.	7½†	Grand Junction, 10 p.c. max.	127—132	..	2 16 9
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	148—152	..	2 12 8
708,000	Stck.	13 Feb.	12	Kent	347—352	..	3 8 3
160,000	,,	,,	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	30 Dec.	7½†	Lambeth, 10 p. c. max.	275—280	..	2 11 8
406,200	100	,,	7½†	Do. 7½ p. c. max.	227—232	..	3 2 6
350,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	147—152	..	2 12 8
500,000	100	13 Feb.	12¾	New River, New Shares	433—438	+3	2 18 3
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	154—159	..	2 10 4
902,300	Stck.	16 Dec.	6	S'thwk & V'xhall, Ordinary	167—172	..	3 9 9
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	155—165	..	3 12 9
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	168—173	..	2 17 9
1,019,585	,,	15 Apl.	4	Do. 4 p. c. A Deb. Stk.	147—152	..	2 12 8
1,155,066	Stck.	16 Dec.	10	West Middlesex	327—332	..	3 0 2
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	157—162	..	2 15 6

† Next dividend will be at this rate. *Ex div.

however, are steady at recent quotations. At the pit mouth, the better qualities of Arley are not fetching above 9s. 6d. to 10s. per ton, except in special cases; Pemberton four-feet and seconds Arley, 8s. to 8s. 6d.; common house coal, 6s. 6d. to 7s.; steam and forge coals, 5s. 6d. to 6s.; common slack, 3s. 6d. to 4s.; and better sorts, 4s. 6d. to 5s. Slackness still prevails in the shipping trade; and 7s. per ton delivered Mersey ports remains the full average figure for ordinary steam coal.

Northern Coal Trade.—Whether due to the desire to enlarge stocks before the termination of the Conciliation Boards or not, there has been a fuller demand for several classes of coal; and the collieries have worked more regularly. Best Northumbrian steam coals are firmer at 8s. 3d. per ton f.o.b.; and most of the pits are now working full time. There is, in consequence, an increased output of small coal; and steam smalls are offered at 3s. 9d. per ton, or rather lower in one or two cases. Manufacturing coals are now in somewhat better demand, and there are large deliveries; but they are under contracts, at prices that do not vary. In regard to gas coals, the local consumption is now at its lowest; and it may be expected that in a week or two there will be a desire to enlarge orders, so as to accumulate stock. Shipments of gas coals continue to be very good, especially on contracts for some of the Baltic ports. Generally, the price varies from 6s. 3d. to 6s. 6d. per ton f.o.b., though one or two exceptionally situated collieries are able to ask a higher price. No new contracts for any large quantities have been entered into this week. A fair demand prevails for smithy coal, at a relatively good price. In the coke trade, the shipments continue very moderate; and in one or two cases, a little lower price is taken, so that the quotation varies from 14s. 6d. to 15s. per ton f.o.b. In the home demand, there is a large consumption, for the output of the local furnaces was never so large as it now is; and this, of course, entails a corresponding consumption of coke. Delivered at the Teesside furnaces, the general quotation for best blast-furnace coke is now 13s. 9d. per ton. The gas coke trade remains very languid; the production being limited at the present time, and the demand also, especially for shipment.

Scotch Coal Trade.—Trade is proceeding on the lines which have been developing during the past few weeks—there is a large volume, with current prices unaltered, and with a growing tendency on the part of purchasers to contract forward at present prices, but a decided dislike on the part of coalowners to give these terms. It seems that both sides contemplate that, with the expiry of the Rosebery agreement in England in August, prices will rise. This has the effect of keeping trade upon the short contract system to a very large extent. Coal is plentiful; the miners being diligent, and, in the meantime, contented in their work. The prices quoted are: Main, 5s. 9d. (easy) per ton f.o.b. Glasgow; ell, 6s. 3d. to 6s. 9d.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. The shipments for the week amounted to 152,779 tons—a decrease of 14,868 tons upon the quantity in the preceding week, but an increase of 17,826 tons when compared with the corresponding week of last year. For the year to date, the total shipments have amounted to 2,846,790 tons—an increase over the same period of last year of 196,978 tons.

New Gasholder for Dorchester.—The Directors of the Dorchester Gas Company have selected the firm of Messrs. S. Cutler and Sons, of Millwall, for carrying out the construction of the new gasholder which they have decided to have erected this year.

Reductions in Price.—The Battle Gas Company have resolved to reduce the price of gas to 4s. 2d. per 1000 cubic feet. At their meeting last Wednesday, the Nelson Town Council decided to reduce the price of gas by 3d. per 1000 cubic feet as from the end of the present month.

Stockton Corporation Gas and Electric Light Undertakings.—The Corporation of Stockton propose to augment the present make of gas by adopting a carburetted water-gas plant, at an estimated cost of £5000. Being under an obligation to instal the electric light for public purposes, or allow a private company to do so, the Corporation are applying to the Board of Trade for an extension of time, which would otherwise expire in August. At present the larger industrial companies and three or four tradespeople in the High Street have their own installations. The Corporation think that at present it is inopportune for them to spend £20,000 on the electric light, having regard to the somewhat high rates.

The Commissioners of Sewers and London Water Questions.—At the meeting of the Commissioners of Sewers of the City of London last Tuesday, Mr. Goldney, the Remembrancer, reported that in the Sea Water Bill, which was a private and unopposed measure, clauses had been introduced by agreement with the promoters, saving the rights of the Commission as to the opening of streets, drains, &c., in the City; and the Bill had passed the House of Commons. It had now been found, from the text of the Bill to be submitted to the House of Lords, that certain other clauses had been inserted, giving the County Council authority and jurisdiction over the streets in the City as well as the Metropolis for the purposes of the Act; and he suggested that the Commission should petition against those provisions. This was agreed to; some members suggesting that the obnoxious clauses had been permitted to be "smuggled" into the Bill through want of vigilance on the part of the City officials. The Remembrancer said there was no foundation for this assertion. Mr. Malthouse moved that it be referred to the Streets Committee to consider and report as to the desirability of utilizing the surplus water from the artesian well in the Minories for street watering and kindred purposes. He observed that the construction of the well had been expensive; but the money had been spent profitably, if only in establishing that the alleged monopoly of the New River Company to supply London with water had no existence. In some districts, the charge being calculated on the rateable value of the premises, the water actually used was as dear as champagne. The artesian well gave three times the quantity which was needed for the artisans' dwellings; and he suggested that it should be utilized for street cleansing and sewer flushing, for which the Commission paid the New River Company £1652 per annum. In this way the initial cost of the well would be recouped. Mr. Cloudsley seconded the motion; and it was adopted.

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402	24½	15½	15	18	11	11	15½ ,, 15	2	40/-	2/6
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404	If fitted with Enamelled-Lined and Jacketted Door and Fire-Brick Crown, as adopted by The London Gaslight and Coke Co.								55/-	2/6

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The Gas and Electric Lighting Questions at Wells.—At the monthly meeting of the Wells Town Council last week, the gas and electric lighting questions were again considered. At the previous meeting, a resolution was passed to the effect that the Gas Company—whose undertaking the Council wished to purchase for £14,700, but could not without a Special Act of Parliament—should be asked to contribute towards the cost of obtaining the Act. The Company now wrote declining to contribute, but informing the Council that it was their intention to lower the price of gas to 3s. 6d. per 1000 cubic feet. A very long and tedious discussion ensued, in the course of which it was moved that Dr. Hopkinson be instructed to prepare plans and specifications for an installation of the electric light; and this was carried by a majority of one.

The Contribution of the Water Companies to the Thames Conservancy.—From the accounts of the Thames Conservancy for 1895, which were passed by the Conservators at their last meeting, it appears that the total receipts of the upper navigation during the year were £36,385. This sum is nearly £6000 in excess of the proper revenues, as it includes a payment from the Water Companies not strictly belonging to the period in question. The portion of this revenue due to tolls and sources other than the Water Companies amounts to £7343; so that the large proportion of the revenue of the upper navigation is derived from the Companies in payment for the water they take, and for the proper attention of the Conservancy to the careful purification of the river and its tributaries throughout the Thames drainage area. The expenditure of the Conservancy for the year amounted to £30,373.

A New Reservoir for Neath.—The ceremony of cutting the first sod of a new water reservoir for Neath has lately been performed by the Mayoress (Miss Jones) in the presence of the members of the Town Council and a considerable number of the inhabitants; the handsome spade which she used for the purpose being presented to her by the Corporation. On behalf of the town officials, the Town Clerk handed to the Mayor a beautiful goblet as a memento of the day's proceedings; and in the evening his Worship gave a grand banquet. Regarding the present extension of the water-works, the Council realized some years ago that a better water supply was absolutely necessary. In 1893 plans for new works were prepared by the Borough Surveyor (Mr. W. M. Jenkins); and in 1894 parliamentary powers were obtained. In February this year the contract for carrying out the work was secured by Mr. James Allen, of Cardiff; the price being £12,285. The site of the reservoir is in the Gnoll Woods. The Corporation have acquired a perpetual easement, and have to pay a rental of £10 per acre per annum. The new reservoir will have a superficial area of 3 acres, with a capacity of 20 million gallons. There will be no difficulty in regard to pressure, inasmuch as the site of the reservoir is 400 feet above the town. The reservoir itself will be supplied by springs from Cefn Morfydd mountains, about a mile distant. The stream which flows into it is very beautiful. There are numerous cataracts along its course; the last leaping from a height of 20 feet into the reservoir.

Abandonment of the Ampthill Water Scheme.—At a meeting of the Ampthill District Council last Thursday week, the Clerk read a letter from the Local Government Board with regard to a complaint that the Council had made default in providing a proper water supply, and enclosing a copy of a letter from Mr. F. T. Tanqueray, the Solicitor to the promoters of the Ampthill water scheme, pointing out that, owing to the consent of the Local Authority not having been obtained, the Board of Trade had declined to allow the Provisional Order applied for to be proceeded with. The Secretary of the Local Government Board added that the Board had issued an order limiting to six months from its date the time within which the District Council should perform their duty in the matter of providing a water supply. The Chairman (Mr. Seabrook) said he would not accept the onus of the old Council, whose scheme would cost about £12,000; and he should therefore resign, and leave it to the people of Ampthill to do as they pleased. It was resolved to inform the Local Government Board that their letter was the first intimation that the Council had received that the Water Syndicate had abandoned their scheme.

Coventry Corporation Gas Supply.—At the meeting of the Coventry City Council last Tuesday, the annual report of the Gas Committee, noticed in the "JOURNAL" last week, was presented. Mr. Andrews, in moving the adoption of the report, stated that the invested capital in the undertaking was £207,424, of which £198,886 had been expended. He defended the proposed application of £1000 for sinking fund purposes by saying that at the present time the fund amounted to only one-tenth of the eventual claim to be made upon it. The year's trading had been a successful one, except that sulphate of ammonia had brought in £1800 less than in the previous year. Mr. Haywood seconded the motion; and Mr. Drinkwater obtained the information that experiments are being made with penny-in-the-slot meters. Alderman Tomson criticized the policy of the Gas Committee in producing so small an amount of profit for the ratepayers. He insisted that the undertaking should be regarded as a commercial one, and said that if a 10 per cent. profit were made, that would give £8000 to pay the interest on gas annuities, and leave £10,000 for the sinking fund and reduction of rates. The present profits were only about 7¼ per cent.; and there was a dangerously narrow margin for the adjustment of the claims of gas consumers and ratepayers. As a matter of fact, the large consumers were getting, with their rebates, gas at about the cost of its production. Alderman Gulson took the same line of criticism, and contended that a 10 per cent. profit was not too much. Mr. Andrews, replying on the discussion, said the Gas Committee had sought to put their charges at those of other towns near, so that manufacturers desiring to establish trades might not avoid Coventry owing to the greater cost of gas; and at both Birmingham and Leicester the profits taken for the ratepayers—4d. or 5d. in the pound—were about the same as at Coventry. The Council could, if they liked, increase their income from the gas undertaking; but he had no doubt the consumers were numerous and strong enough to take care of themselves. The report was adopted.

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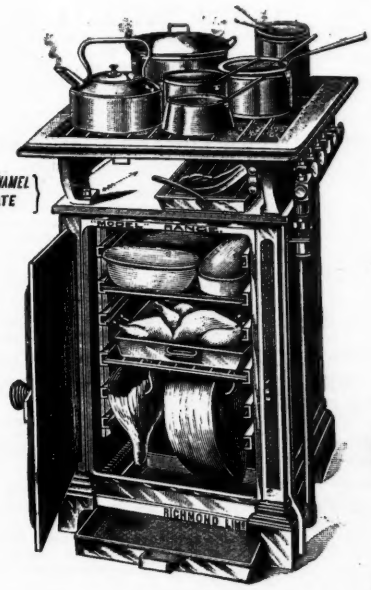

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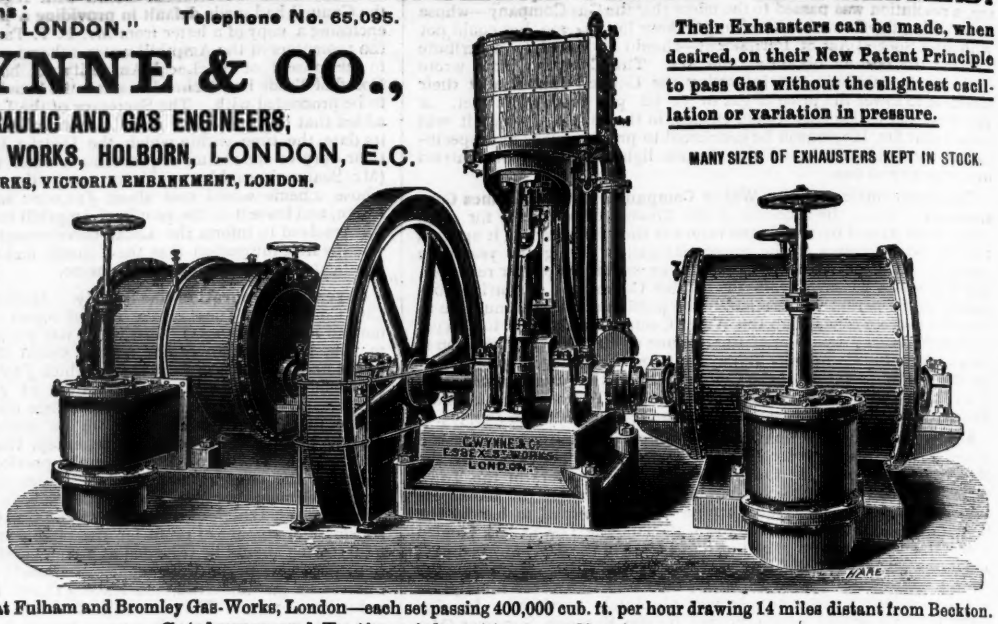

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Gas Offices, Bolton,
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BOROUGH OF WARRINGTON.
(GAS DEPARTMENT.)

COAL AND CANNEL.

THE Gas Committee invite Tenders for the supply of 12,000 Tons of COAL and 3000 Tons of CANNEL.
Full Particulars can be obtained on application to Mr. W. S. Haddock, Engineer to the Works.
Sealed tenders, endorsed "Tenders for Coal or Cannel," as the case may be, and addressed to the Chairman, Gas Committee, to be sent in not later than the 25th inst.
FREDK. TAYLOR,
Secretary.
Gas Offices, Warrington,
June 5, 1896.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the supply of the whole or part of 10,000 Tons of the best screened GAS COAL and of 1000 Tons of CANNEL, to be delivered free at Macclesfield, at such times and in such quantities as shall be ordered. Deliveries to commence on the 1st of September, 1896, and to be completed within a Year.
Forms of Tender and Conditions may be had on application to the Engineer, Gas-Works, Macclesfield.
Tenders, sealed and endorsed, to be sent in not later than Saturday, the 20th day of June, 1896, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield.
The Committee do not pledge themselves to accept the lowest or any tender.
W. FREDK. TAYLOR,
Town Clerk.
May 26, 1896.

MALMO, SWEDEN.

INTERNATIONAL COMPETITION FOR PROPOSALS FOR NEW GAS-WORKS.

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Plans, and Programme, in the Swedish, English, or German Language, may be obtained on application to the Gas-Works Office.
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THE BOARD OF THE GAS-WORKS.
Malmo, May, 1896.

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THE Company are prepared to receive TENDERS for the supply during the Twelve Months from June 30, 1896, to June 30, 1897, of from 1200 to 1500 Tons of best screened GAS COAL, in quantities and at times to suit the requirements of the Company.
Tenders to be forwarded to J. W. MONTFORD, Solicitor, Ludlow, SALOP.

GAS COAL.

THE Directors of the Leyland and Farington Gas Company are prepared to receive TENDERS for their supply of COALS for the next Twelve Months.
Quantity used: About 2000 Tons of Coal and 400 Tons of Cannel.
Tenders, endorsed "Gas Coal," to be in by Monday, the 22nd of June.
No special form of tender supplied.
CHARLES ELLIOTT,
Secretary.
Leyland, Lancs.,
June 4, 1896.

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The Directors of the Leyland and Farington Gas Company are prepared to receive TENDERS for the surplus TAR and LIQUOR produced at their Works during the next Twelve Months.
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Secretary.
Leyland, Lancs.,
June 4, 1896.

NEWARK GAS COMPANY.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Works for One Year from the 1st day of July, 1896, at per degree Twaddel (Temperature 60° Fahr.). The Liquor to be not less than 5° in Strength.
Terms: Cash monthly.
Further Particulars can be had on application to the undersigned, to whom sealed tenders, marked on the outside "Tender for Liquor," are to be sent on or before the 24th of June.
The highest tender will not be necessarily accepted.
F. B. FOOTTIT,
Secretary.
Newark, May 29, 1896.

NEWARK GAS COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Newark Gas Company are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, free on Rail, G.N.R. or M.R., in Purchaser's Tanks, for One Year from the 1st day of July, 1896.
Terms: Cash monthly.
Further Particulars can be obtained on application to the undersigned, to whom sealed tenders are to be sent on or before the 24th of June next, marked on the outside "Tender for Tar."
The Directors do not bind themselves to accept the highest or any tender.
By order,
F. B. FOOTTIT,
Secretary.
Newark, May 29, 1896.

COUNTY BOROUGH OF BURY.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Corporation are prepared to receive TENDERS for the supply for One, Two, or Three Years of—
3000 Tons of CANNEL per annum.
30,000 Tons of GAS COAL per annum.
500 Tons of BURGY per annum.
200 Tons of HOUSE COAL per annum.
The same to be delivered in such quantities and at such times as the Gas Engineer of the Corporation may from time to time order.
Printed Forms of Tender and Conditions of Contract may be obtained on application to Mr. W. H. S. Gendall, Engineer, Gas-Works, Bury.
Tenders, which must be on the printed forms, and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Bury, marked "Tender for Gas Coal," to be delivered not later than the 17th of June, 1896.
Preference will be given to those persons or firms who pay to their workpeople the regular standard rate of Wages obtaining at the time in the town or district.
JOHN HASLAM,
Town Clerk.
Corporation Offices, Bury,
May 28, 1896.

CITY OF LEEDS.
(GAS DEPARTMENT.)

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the supply of about 40,000 Tons of CANNEL and about 140,000 Tons of best GAS COALS (Screened or Nuts). Price per ton to be quoted delivered at the Meadow Lane Gas-Works (Hunslet Lane Siding), New Wortley (Gelderd Junction Siding), or at the Gas-Works, York Street, in such quantities as may be required.
Forms of Tender, and further Particulars, may be obtained on application to the undersigned.
Tenders may be for any portion of the total quantity required, and will be received not later than Wednesday, the 17th of June next, addressed to the Chairman of the Gas Committee, Municipal Offices, Calverley Street, and endorsed "Tender for Coal."
The Committee do not bind themselves to accept the lowest or any tender.
R. H. TOWNSLEY,
General Superintendent.
Municipal Offices, Calverley Street,
Leeds, May 30, 1896.

CITY OF LEEDS.
(GAS DEPARTMENT.)

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for Two Steel LANCASHIRE BOILERS, 30 ft. by 8 ft. diameter, for the New Wortley Gas-Works.
Plan can be seen, and Specification obtained, on application to the undersigned.
Tenders, endorsed "Boilers," and addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Monday, the 15th inst.
The Committee do not bind themselves to accept the lowest or any tender.
R. H. TOWNSLEY,
General Superintendent.
Municipal Buildings, Calverley Street,
Leeds, June 6, 1896.

SCARBOROUGH GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Scarborough Gas Company invite TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR to be produced at their Works for One or more Years from the 1st day of July next.
Tenders for Liquor may be submitted either at a fixed Price per ton or on a Sliding Scale, regulated by the Price of Sulphate. Preference will, however, be given to the latter.
Further Particulars may be obtained on application to the undersigned, to whom sealed tenders (duly endorsed) must be delivered not later than noon, on Saturday, the 13th of June next.
The Directors do not bind themselves to accept the highest or any tender.
By order of the Board,
(Signed) J. HOLLIDAY,
Engineer and Secretary.
Gas Offices: 32, Westborough, Scarborough,
May 20, 1896.

TO GAS MANUFACTURERS AND OTHERS.

SALE OF INCLINED RETORT PLANT.

THE Gas and Water Committee of the Birkenhead Corporation invite OFFERS for the Purchase and Removal of the following RETORT-HOUSE PLANT, viz.:—
4 Lengths of Hydraulic Main, 10 ft. 6 in. long.
4 Lengths of Secondary Main, 11 ft. long.
28 Dip-Pipes.
28 Bridge-Pipes.
28 Ascension-Pipes.
28 Mouthpieces.
5 Stands for Hydraulic Main.
4 Furnace-Doors.
15 Steel Vertical Buck-Stays.
16 Steel Horizontal Buck-Stays.
8 Buck-Stay Bolts.
The Plant may be seen at any time at the Gas-Works; and further Information may be obtained on application to the Gas Engineer, Gas-Works, Thomas Street, Birkenhead.
Tenders, sealed and endorsed "Tender for Gas Plant," to be sent in to me not later than Five o'clock in the afternoon of Friday, the 19th of June, 1896.
The Corporation do not bind themselves to accept the highest or any tender.
By order,
ALFRED GILL,
Town Clerk.
Town Hall, Birkenhead,
June 1, 1896.

THE Sunderland and South Shields Water Company invite OFFERS of THREE NEW STEEL BOILERS, of about 30 feet by 7 feet, with all the Fittings complete, delivered and fixed, capable of working up to 80-lbs. Pressure. Also a pair of PUMPING-ENGINES, capable of lifting 3 million Gallons of Water in 24 hours from a depth of say 85 fathoms. The Engines to have Surface Condensers (the Water pumped to be used for condensing), with Expansion Valve Gear for working the Engines, either as condensing or non-condensing, with two sets of Well Pumps suitable for sinking purposes, with Connecting-Rods, Spear Plates, Buckets, Clacks, Bucket and Clack Doors, and Cisterns complete. The Engines to have Pumps or Rams attached to force the Water to an additional height of 17 fathoms when required.
The whole of the above (with the exception of the Pumps) to be delivered and fixed complete on the Company's new Works at Thorpe, near Easington, and kept in repair for twelve months after commencing to work. The Pumps to be delivered on the Company's Land, and to be fixed by the Water Company's Workmen under the superintendence of the Contractor.
Early delivery can be taken.
The Company will not be bound to accept the lowest or any offer.
For further Particulars, apply at the Company's Offices, 16, Fawcett Street, Sunderland.
Offers on or before the 23rd inst.
June 2, 1896.

BOROUGH OF ROCHDALE.

TO RETORT SETTERS AND CONTRACTORS.

THE Gas Committee of the above Corporation invite TENDERS for the ALTERATIONS required to Five Settings of INCLINED RETORTS.

Plans may be seen, and Particulars of the Work and Materials required may be obtained, on application at the Gas-Works.

Tenders, endorsed "Inclined Retorts," must be sent in to me not later than Tuesday, June 23, 1896.

T. BANBURY BALL,
Engineer and Manager.

Gas-Works, Rochdale,
June 5, 1896.

WALLINGFORD GASLIGHT AND COKE COMPANY, LIMITED.

TENDERS FOR GASHOLDER.

THE Wallingford Gaslight and Coke Company, Limited, invite PLANS, SPECIFICATIONS, and TENDERS for the supply and erection of a new GASHOLDER, 35 feet diameter and 10 feet deep, at their Works at Wallingford.

Full Particulars will be supplied on application to the Manager at the Works.

Tenders, &c., to be forwarded to the Secretary at Wallingford on or before the 25th inst.

The Company do not engage to accept the lowest or any tender.

J. COWLING,
Manager.

Wallingford, June 6, 1896.

ISLE OF THANET GAS COMPANY, MARGATE.

THE Directors of the above Company are prepared to receive TENDERS for the supply of PETROLEUM SPIRIT, ·700 sp. gr., for Six Months from the 1st of July next.

For Particulars as to Quantity and mode of Delivery, apply to the Engineer and Manager, Mr. H. H. Jones.

Tenders, addressed to the Chairman, and endorsed "Tender for Petroleum Spirit," to be delivered at these Offices on or before Thursday, the 18th of June.

The Directors do not bind themselves to accept the lowest or any tender; and further reserve the right to accept any tender for three months only instead of the full term.

THOS. C. FULLER,
Secretary.

Gas Offices, Margate,
June 5, 1896.

SMETHWICK GAS-WORKS.

TENDERS FOR GAS COAL AND LIME.

THE Gas Committee of the Urban District Council of Smethwick invite TENDERS for the supply of about 17,000 Tons of GAS COAL, for delivery over the Year ending the 30th of June, 1897.

Forms of Tender may be obtained from the undersigned.

Tenders are also invited for the supply of about 300 Tons of Purifying LIME during the same period.

Sealed tenders, endorsed "Tender for Gas Coal" or "Lime" (as the case may be), and accompanied, if possible, by an Analysis, to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned on or before June 16, 1896.

By order,
W. J. STURGES,
Secretary.

Public Buildings, Smethwick,
May 28, 1896.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation are prepared to receive TENDERS for the Supply of—

1. Wrought-Iron Tubes and Fittings.
2. Cast-Iron Pipes.
3. Lime for Gas Purification.
4. Sulphuric Acid.
5. Oxide of Iron.

And for the Purchase of—

1. Spent Oxide of Iron.
2. Brimstone.
3. Carbon.

For the Twelve Months ending the 30th of June, 1897.

Forms of Tender and further Information may be obtained on application to Mr. Thomas Holgate, Engineer, Gas-Works, Halifax.

Tenders, properly endorsed, to be sent to the undersigned before Ten o'clock a.m., on Wednesday, the 17th of June, 1896.

By order,
KEIGHLEY WALTON,
Town Clerk.

COUNTY BOROUGH OF HUDDERSFIELD.

TENDERS FOR GAS COAL AND NUTS.

THE Gas Committee are prepared to receive TENDERS, from Colliery Proprietors only, for the supply and delivery of from 50,000 to 60,000 Tons of unscreened GAS COAL and screened NUTS for a period of Twelve Months, commencing the 30th of September next.

Full Particulars and Form of Tender may be obtained on application to the Engineer and Manager, Mr. W. R. Herring, Gas-Works, Huddersfield.

Sealed tenders, endorsed "Tender for Gas Coal," must be delivered, free of charge, addressed in the handwriting of the tenderer or his agent to the Town Clerk, Town Hall, Huddersfield, and delivered not later than Thursday, the 18th day of June, 1896.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
F. C. LLOYD,
Town Clerk.

Town Hall, Huddersfield,
May 27, 1896.

OAKHAM GAS COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive TENDERS for the supply of about 1000 Tons of best screened GAS COAL.

For Particulars and Forms of Tenders, apply to the Manager, Jas. Mason.

Gas Office, Oakham,
June 4, 1896.

SEAFORD GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of 600 Tons and upwards of GAS COAL, to be delivered, in Ten-Truck Lots as required, within Twelve Months, carriage paid, to Seaford Station. Also for 50 Tons and upwards of CANNEL to be delivered, as required, carriage paid, to Seaford Station.

The Directors do not bind themselves to accept the lowest or any tender.

No form of tender supplied.

JAMES COWNEY,
Secretary.

THE Urban District Council of Hindley are prepared to receive TENDERS for the supply of GAS COAL, CANNEL, ENGINE SLACK, and LIME required at their Gas-Works during the ensuing Twelve Months, and also for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Twelve Months.

Full Particulars, with Forms of Tender, can be obtained on application to Mr. Wm. Dickinson, Gas and Water Manager.

Sealed tenders, endorsed "Tender for Gas Coal, &c.," to be lodged with the undersigned not later than Monday, June 15, 1896.

By order,
STEPHEN HOLT,
Clerk to the Council.

Offices: Cross Street, Hindley,
June 3, 1896.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

SPENT OXIDE.

THE Gas Committee invite Tenders for the purchase of about 350 TONS of SPENT OXIDE.

Further Particulars and Forms of Tender may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Spent Oxide," to be sent to me not later than Five p.m., on Thursday, the 18th inst., addressed to the Chairman of the Gas Committee, Town Hall, Salford.

By order,
SAML. BROWN,
Town Clerk.

Town Hall, Salford,
June 4, 1896.

BOROUGH OF BATLEY.

TENDERS FOR GAS COAL.

THE Corporation of Batley are prepared to receive TENDERS for the supply and delivery at their Gas-Works of 16,000 Tons of GAS COAL.

Conditions and Forms of Tender may be obtained on application to the Manager at the Gas-Works.

Sealed tenders, addressed to me, and endorsed "Gas Coal," to be delivered at my Office by noon on Monday, the 29th June inst.

The Corporation do not bind themselves to accept the lowest or any tender, and may accept any tender for a part only of the specified quantity.

By order,
JOS. HANSON CRAIK,
Town Clerk.

Town Clerk's Office, Batley,
June 5, 1896.

HERTFORD GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of 2200 Tons of unscreened YORKSHIRE SILKSTONE GAS COAL, to be delivered, as required, between the 1st of September next and the 30th of June, 1897, at the G.N. Railway Gas-Works Siding, Hertford.

A seaborne Coal, delivered alongside Works Wharf, to be also quoted. The right of taking either Coal under the contract is reserved.

The Directors also reserve the right to divide the contract.

Tenders, endorsed "Coal," to be sent in by the 22nd of June next.

ROBT. WATSON,
Manager and Secretary.

Gas-Works, Hertford,
June 6, 1896.

TO GASHOLDER MAKERS.

THE Goole Urban District Council invite TENDERS for the construction and erection of a GASHOLDER, 100 feet in diameter.

The Drawings and Specification may be seen at the Offices of the District Council, and at the Office of Messrs. Thomas Newbigging and Son, Engineers, 5, Norfolk Street, Manchester.

Copies of the Bill of Quantities and Form of Tender may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a *bond-fide* tender.

Sealed tenders, endorsed "Gasholder, Contract No. 2," to be sent so as to reach me not later than Ten a.m. on Tuesday, the 30th day of June, 1896.

The Council do not bind themselves to accept the lowest or any tender.

GEORGE ENGLAND,
Clerk.

Urban District Council Offices, Goole,
June 5, 1896.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS in respect both to the Four-and-a-Half per Cent. and Three per Cent. DEBENTURE STOCKS WILL BE CLOSED on the 15th of June inst., and RE-OPENED on the 1st of July, 1896.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, Bishopsgate, E.C.,
June 6, 1896.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company so far as they relate to the DEBENTURE STOCK WILL BE CLOSED at Ten o'clock forenoon on Friday, the 12th inst., and RE-OPENED on Friday, the 26th inst.

The Interest for the Half Year to the 30th of June, 1896, will be payable on the 1st day of July next to the Proprietors registered on the closing of the Books.

By order of the Board,
JAMES RANDALL,
Secretary.

Gas Offices: Willoughby Lane,
Tottenham, June 5, 1896.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

BY ORDER OF THE DIRECTORS OF THE WEST HAM GAS COMPANY.

SALE OF £10,000 DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell by AUCTION at the Mart, London, E.C., on Wednesday, the 17th of June, at Two o'clock precisely, in Lots, £10,000 PERPETUAL 4 PER CENT. DEBENTURE STOCK OF THE WEST HAM GAS COMPANY, to be created under the Provisions of the West Ham Gas Act, 1889, and offering to Trustees and others an Investment of the soundest character.

Particulars of the SECRETARY of the Company, at the Offices, STRATFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Gas and Water Stocks and Shares of the Capital Value of upwards of £15,000 brought into the Market by order of the Executors, and

TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS at the Mart, Tokenhouse Yard, E.C., on Monday, June 15, at Two o'clock precisely, in Lots.

The Stocks and Shares are in the following Undertakings:—

Crystal Palace District Gas Company, £2412 Stock.
Barnet District Gas and Water Company, £1305 Stock.
Hastings and St. Leonards Gas Company, 36 £20 Shares.
Bournemouth Gas and Water Company, 84 Shares.
Worthing Gaslight and Coke Company, 117 £10 Shares.
Chipping Norton Gas Company, 211 Shares.
Ascot District Gas Company, 83 £10 Shares.
Wandsworth and Putney Gas Company, £76 10s. Stock.
Enfield Gas Company, 11 £10 Shares.
Winchester Water and Gas Company, 12 £25 Shares.
West Kent Gas Company, 17 Shares.
Portsea Island Gas Company, 7 Shares.
Bognor Gas Company, 5 Shares.
Soham Gas Company, 30 £10 Shares.

All paying good Dividends and offering Investments of the very highest character.

Full Detailed Particulars, when ready, may be obtained of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the Aldershot Gas and Water Company, the Directors of the Colonial Gas Association, Limited, and other Owners.

GAS and WATER STOCKS, SHARES, and DEBENTURES IN THE FOLLOWING COMPANIES:—

Aldershot Gas and Water Company,
Colonial Gas Association, Limited,
Lambeth Water-Works Company,
Kingston-on-Thames Gas Company,
Belgrano (Buenos Ayres) Gas Company,
Lowestoft Water, Gas, and Markets Company,
Hornsey Gas Company,
Great Yarmouth Water-Works Company,
Dorking Gas Company,

To be SOLD by AUCTION, by

MR. ALFRED RICHARDS, at the Mart, Tokenhouse Yard, E.C., on Monday, June 29, at Two, in Lots.

Particulars may be obtained at the Place of Sale; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

All Sizes of Elevators and Conveyors of every class, for Coal, Coke, Mechanical Stoking, and all other purposes, made and erected by the NEW CONVEYOR COMPANY, LTD., Transport Appliance Works, SMETHWICK.

(ALL NEW PATTERNS)

BIRMINGHAM.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

5, PRINCES STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

LOW MOOR BLACK BED

GAS COAL.

YIELD OF GAS PER TON - 10,375 CUBIC FEET.
ILLUMINATING POWER - 17·50 SPERM CANDLES.
COKE - - - - - - - - 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

GEORGE & JOHN HAIGH,

RAVENS LODGE AND CONYERS' COLLIERIES,

DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED,

— *v* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT, WHETHER

MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.
Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.

See Advertisement in last and next issue.

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Illuminating Power . .	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
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BEST QUALITY.
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[See Illustrated Advertisement, June 2, p. 1243.]

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Are invited to inspect the

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Which has now been successfully adapted to the purposes of

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THE INCANDESCENT GAS-LIGHT has been tried with most satisfactory results for Street Lighting purposes in many Towns throughout the United Kingdom.

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The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.

After allowing for the extra cost of up-keep, the gain to the Vestry by the use of these burners was £20 3s. 4½d., and a large increase in the Illumination of the Street.

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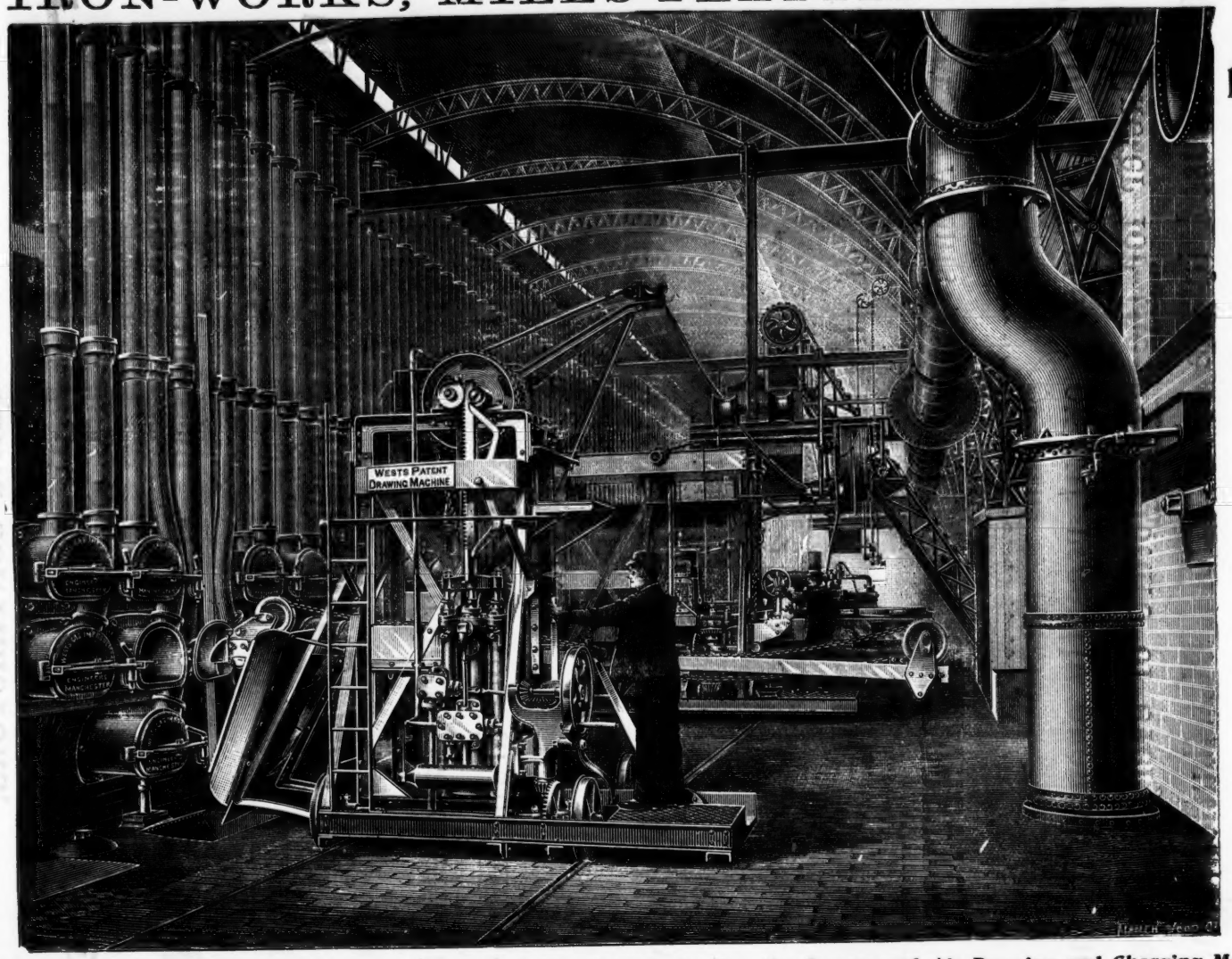

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[See Illustrated Advertisement, June 2, p. 1204.]

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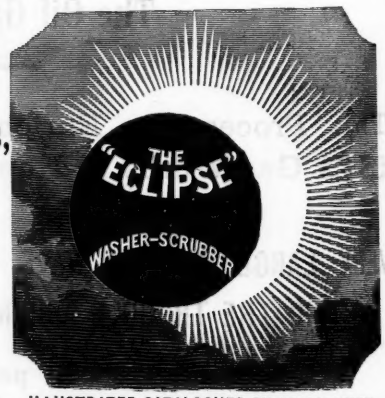

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